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PROGRESSIVE MEDICINE

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES

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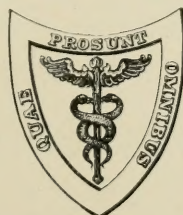
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VOLUME IV. DECEMBER, 1910

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS
AND PERITONEUM—DISEASES OF THE KIDNEYS—SURGERY OF THE
EXTREMITIES, SHOCK, ANESTHESIA, INFECTIONS, FRACTURES AND
DISLOCATIONS, AND TUMORS—GENITO-URINARY DISEASES—
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PROGRESSIVE MEDICINE

DECEMBER, 1910

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS AND PERITONEUM

BY R. S. LAVENSON, M.D.

DISEASES OF THE ESOPHAGUS

Esophageal Malformations. Keith¹ contributes some interesting facts bearing upon esophageal malformations in an article on the various constrictions and occlusions of congenital or obscure origin that occur in the course of the gastro-intestinal tract. His remarks are based upon the specimens of such malformations in the museum of the Royal College of Surgeons, and other museums of the London hospitals. Among these specimens was an apparent disproportionately large number of cases of simple non-cicatricial stenosis of the upper esophageal orifice. Such cases, according to Keith, are frequently considered to be the result of strictures arising from severe localized inflammations, but in none of his cases was he able to find any clear evidence of cicatrization. Eight of the nine instances of stenosis of the upper esophageal orifice Keith believed to be due to atrophy of the circular band of muscle fibers which act as an upper esophageal sphincter and its substitution by fibrous tissue. In the ninth specimen, the stricture was due to hypertrophy of this sphincter.

The collected specimens contain two examples of congenital stenosis of the middle portion of the esophagus and six of diffuse dilatation of the esophagus. The largest number of abnormalities were those in which there was a malformation of the tracheo-esophageal septum. In these cases the esophagus ends as a blind pouch at about the level of the bifurcation of the trachea, and there is a narrow fistulous opening between the trachea or one of the bronchi and the lower portion of the

¹ British Medical Journal, 1910, No. 2562, p. 301.

esophagus. This is the commonest form of congenital malformation of the esophagus according to the experience of all observers. A case of this type is reported by Griffith and Lavenson,¹ who have collected the instances of the various types of esophageal malformation that were published up to the time of their report.

Diverticula. In a subsequent article, Keith² tabulates and discusses the examples of diverticula of the alimentary tract of congenital or obscure origin which were preserved in the museum of the Royal College of Surgeons and the museums of the London hospitals. Among these were ten instances of what Keith designates as "Retrocricoid Diverticula of the Pharynx," which, however, are usually known by the term of pulsion diverticula of the esophagus. These diverticula almost always spring from the posterior wall of the esophagus, the orifice of the pouch being on a level with the cricoid cartilage. The walls of these diverticula are composed of the mucous and submucous coats of the esophagus which have become gradually evaginated between two distinct bands of the inferior constrictor muscle. They are not congenital; they have never been observed in the fetus or in children, and the youngest patient in whom Keith could find the condition recorded was forty-five years of age. Though the condition is not distinctly congenital it is probable that an important factor in its development is a congenital defect in either the structure or the function of the inferior constrictor muscle. The other factor is the internal pressure incident to the act of swallowing.

TRACTION DIVERTICULA. As contrasted with the pulsion diverticula just described are the so-called traction diverticula of which Keith collected twelve examples. These are small pouches located usually on the anterior wall of the esophagus at about the level of the bifurcation of the trachea, and ranging in size from that of a pea to that of a hazel nut. Traction diverticula are caused by either the tugging of peribronchial lymph glands which have been inflamed and have subsequently become organized, or by the constant traction of Ribbert's cord, a fibromuscular cord which runs from the posterior aspect of the trachea or the bronchi to the anterior surface of the esophagus. Traction diverticula rarely give rise to symptoms and are usually first discovered at the postmortem examination. They are supposed, however, to at times give lodgement to food particles which by either their mechanical or chemical irritation induce more or less extensive ulceration.

PULSION DIVERTICULA. Pulsion diverticula, on the other hand, give rise to serious symptoms of a more or less definite nature. According to Cooper,³ the presence of a pulsion diverticulum can be suspected

¹ Archives of Pediatrics, 1909, vol. xxvi, p. 161.

² British Medical Journal, 1910, No. 2563, p. 376.

³ American Journal of the Medical Sciences, 1910, vol. cxxxix, No. 2, p. 221.

if, after the patient has eaten as much as possible, any of the following conditions can be noted:

1. If there be any change in the shape of the neck; if by shaking the patient's throat we can produce a succussion murmur. Or if, after giving the patient two or three bismuth capsules, they can be massaged from the lower part of the neck into the pharynx.

2. If the laryngeal picture has changed. In one patient (under Cooper's care) the filled diverticulum so displaced the larynx that the cords ran from behind forward, and to the left instead of directly forward, as they did before the sack was filled.

3. If there be any change in the character of the radial pulse from that exhibited prior to the eating. In one patient who had a diverticulum the filled sac evidently compressed the big vessels, particularly during deep expiration. If the diverticulum be in the neck region, it is the carotid and jugular pulse that should be inspected.

Umber¹ reports the case of a patient suffering with a pulsion diverticulum in which the history and symptoms were remarkably suggestive; the patient, a man, aged fifty-seven years, and a printer by occupation, first noticed symptoms referable to the esophagus fifteen years ago. He then had the feeling as though something hard were sticking in his throat, and this was associated with almost constant tickling in the throat. At that time he had no dysphagia. About eight years ago he first commenced to have the sensation that something stuck in his throat when he ate, and localized itself "as though in a pocket" just above the left collar bone. For the past two years he has been in the habit of emptying this pocket after each meal by pressing on the region just above the left clavicle. This he had to do especially before lying down at night, otherwise the pressure of the filled sac caused constant tickling. During the past two years the patient has had the sensation when eating or drinking that the food or liquid went into the pocket until it became filled, the remaining food sliding with gurgling and splashing sounds past the pocket into the stomach. If, after a meal, he emptied the pocket, he always found in it those articles of food which were eaten at the beginning of the meal. In the very recent past there has been some dysphagia, especially a short time after the commencement of a meal, indicating that the sac was effecting some stenosis of the esophagus.

The diagnosis of a pulsion diverticulum, which was permitted by so characteristic a train of symptoms, was confirmed by the skiagraph. Another very interesting feature of the case was the fact that the patient's father had for many years suffered with the same symptoms, and that when eating or drinking, the food or liquid frequently returned through either the mouth or nose.

¹ Archiv f. Verdauungskrankheiten, 1909, Bd. xvi, Hft. 1, p. 26.

Though the two forms of diverticulum above described were the only ones generally recognized since Zenker and Ziemssen published their now classical descriptions, Bychowsky, of Warsaw, fifteen years ago described what he thought to be a third variety of esophageal diverticulum, one situated in the thoracic portion of the esophagus. The patient on whom the observations were made, a tailor, aged twenty-one years, presented himself to Bychowsky complaining of vomiting, both during and after meals, and of a sense of pressure under the sternum immediately after taking food. The examination of the esophagus revealed nothing abnormal aside from that. Upon introducing an ordinary stomach tube into the esophagus an impassable obstruction was met 40 cm. from the incisor teeth. If the attempt were made to pass this by force, the tube would apparently turn on its long axis and the blind end would reappear at the mouth. With the tube inserted as far as it could be, 250 c.c. to 300 c.c. of liquid could be introduced. If, however, more than 300 c.c. were introduced, the liquid would spontaneously reappear at the mouth. Previously introduced liquid could always be recovered when the tube was inserted a distance of 22 to 25 cm. from the incisor teeth. Upon the basis of the symptoms and the results of the examination Bychowsky concluded that the patient was suffering from a diverticulum in the thoracic portion of the esophagus. This would, if his interpretation of the signs and symptoms were correct, constitute a hitherto undescribed form of esophageal diverticulum.

The interesting sequel to the above narrative is that fourteen years after these observations were made, the patient came under the care of Spivak, in Denver, for tuberculosis. Dysphagia still persisted but was of a type decidedly more suggestive of cardiospasm than of an esophageal diverticulum. Examining the esophagus by means of a stomach tube Spivak met an obstruction 40 cm. from the incisor teeth. This he was unable to pass with the stomach tube. With an especially constructed bougie, however, he was able to pass the obstruction and, in doing so, received more the impression that he was passing a simple obstruction in the esophagus than that he was entering a diverticulum. He was subsequently able to thread a stomach tube over the bougie and thus introducing it past the obstruction to remove a quantity of fluid which proved itself to be stomach contents. A radiograph taken after the patient had swallowed an emulsion of bismuth showed the latter to be distributed along the normal course of the esophagus. Spivak contends that his findings in no wise suggest the existence of a diverticulum and that there is no justification for Bychowsky's claim that his observations establish a new type of esophageal diverticulum. Spivak concludes that an esophageal stenosis exists associated with more or less dilatation. The length of time that symptoms existed without seriously reducing the patient's weight, he believes, speaks against the existence of an organic stricture, and he concludes that the

patient is suffering from cardiospasm. This narrative, with its long intermission between events, is interesting and instructive in illustrating how difficult is the accurate diagnosis of many diseases of the alimentary tract and how valuable an asset to our diagnostic equipment we possess at present in the Röntgen rays. Had Bychowsky been able to employ this aid to diagnosis, he would undoubtedly not have fallen into error in the case at hand. It moreover illustrates how foolhardy it is to lay claim to the observation of new types of disease on the basis of clinical investigation uncontrolled by pathological findings, unless the clinical investigations lead to unusually conclusive data.

Dilatation. Quite distinct from diverticula of the esophagus are the diffuse dilatations concerning the nature of which there is still so much doubt and confusion. Some observers contend that cardiospasm is the primary cause of dilatation in all cases, others that a tendency to cardiospasm and a congenital weakness of the musculature of the esophageal wall co-exist, and still others hold that all cases of dilatation of any considerable degree are a result of primary weakness of the muscular wall of the esophagus. This weakness is supposed to have its origin in embryological peculiarities of the esophagus. In early fetal life the esophagus is represented by thirteen enteromeres separated from one another by physiological constrictions. Remnants of these fetal constrictions persist in the form of the three physiological points of narrowness in the esophagus (one 2 cm. below the cricoid, the second 2 cm. below the bifurcation of the trachea, the third 2 cm. above the diaphragm). It is supposed by Fleiner, Umber, and others, that if an extraordinary degree of distensibility exists in one or more of these enteromeres the primary cause is established for a subsequent slowly progressive dilatation of all that portion of the esophagus lying above the location of the originally distended area. It is the eleventh and twelfth enteromeres, those located just above the diaphragm, that are usually affected and it is the dilatation of them that constitutes the so-called "vormagen," or prestomach. After considering the various views, I believe that we will be taking a sensible and conservative attitude while awaiting further anatomical and pathological evidence, by believing the high degrees of dilatation to be dependent upon a congenital weakness in the esophageal musculature, either with or without a tendency to spasm of the cardia, and that moderate degrees of dilatation can occur as a result of cardiospasm alone.

Cardiospasm with subsequent esophageal dilatation was discussed in last year's article on the diseases of the digestive tract. Two striking instances of high-grade diffuse dilatation, apparently without cardiospasm, are reported this year, one by Umber¹ the other by May.²

In Umber's case, the esophagus measured 13.4 cm. in its greatest

¹ Archiv f. Verdauungskrank., 1910, Bd. xvi, Hft. 1, p. 26.

² Münch. med. Wochenschr., 1909, No. 41, p. 2113.

transverse diameter after the organ had been hardened and somewhat shrunk in formalin. In May's case, the greatest transverse diameter was 23 cm. In neither case was there any narrowing of the lumen of the cardia or any hypertrophy of the muscle, thus in all probability excluding the previous existence of either an organic or a spasmodic stricture in the region of the cardia.

Cysts. Cysts of the esophagus are by no means of frequent occurrence and do not characterize their presence by any symptoms permitting them to be diagnosticated during life. Staehelin-Burckhardt¹ reports a cyst of the esophagus discovered at autopsy in a nine months old child dying of meningitis. The cyst situated just above the diaphragm measured 5.8 cm. by 4.5 cm. by 2.5 cm. Its wall consisted of three layers, an outer connective-tissue layer, a middle layer composed of unstriated muscle, and an inner layer of mucous membrane which closely resembled that of the fundal portion of the stomach. The author collected 13 other cases of cyst of the esophagus; 6 of these were located on the posterior esophageal wall, and 3 on the anterior esophageal wall; in the remaining cases the location was not specified. One feature common to all of the cysts was the possession of three layers similar to that of some portion of the gastro-intestinal tract. Keith² speaks of six instances of cysts of the esophagus that he collected in the museums of London which are not included in Staehelin-Burckhardt's list. One of these, a cyst about 20 mm. in diameter located in the wall of the upper part of the esophagus, was lined by epithelium similar to that of the trachea. Almost all of these cysts have their origin apparently very early in embryological life; this fact undoubtedly accounts for the variations in the type of epithelium with which they are lined.

Esophageal Peptic Ulcers. Peptic ulcer of the esophagus is of relatively infrequent occurrence, as is shown by the statistics of Tileston,³ who was able to collect but 44 cases from the literature. Ewald⁴ discusses the general features of the diagnosis of esophageal peptic ulcers. The pain produced by the ulcer occurs immediately after the taking of food and corresponding to its location in the lower portion of the esophagus, is referred to the lower end of the sternum or the region just to the left of it. Occasionally the ulcer produces pain between the shoulder blades, and tenderness over the spine of the lower thoracic vertebræ. Hematemesis, or the demonstration of blood in the feces, would tend to strengthen the diagnosis. If healing occurs, symptoms of a more or less complete stenosis of the esophagus make their appearance. Some assistance to the diagnosis, according to Ewald, can be

¹ Archiv f. Verdauungskrank., 1909, Bd. xv, Hft. 5, p. 584.

² British Medical Journal, 1910, No. 2563, p. 376.

³ American Journal of the Medical Sciences, August, 1906, p. 240.

⁴ Berlin klin. Wochenschr., 1910, No. 5, p. 180.

found in the simultaneous existence of a gastric ulcer, or in a history indicative of the previous existence of one. All of these features, however, are insufficient for a diagnosis, as they might occur in a gastric ulcer located just below the cardia or on the lesser curvature of the stomach, as well as in inflammatory, traumatic, or neoplastic affections of the esophagus. Considerable importance can be attached to the sub-sternal pain, especially if it radiates upward. Occasionally in gastric ulcer, however, the pain is located high up under the sternum. Of more importance than spontaneous pain is the localized tenderness in the esophagus when an esophageal bougie or a stomach tube is passed. By excluding diverticulum or dilatation, a radiographic examination would be of value in establishing the diagnosis and an esophagoscopy examination is of the greatest importance.

The differential diagnosis between an ulcer situated just above the cardia and one situated just below the cardia is practically impossible unless it be by means of the esophagoscope. From ulcers below the cardia, esophageal peptic ulcers can usually be differentiated by means of the gastric examination after a test meal, by the location of the pain, and by the more frequent occurrence of hematemesis in gastric ulcer. The ulcers that occur in the course of infectious diseases, especially tuberculosis and syphilis, and those resulting from trauma or the disintegration of neoplasms are usually readily differentiated from peptic ulcers by the history, course, and symptoms. Furthermore, the lesion in most of these conditions is located in the upper or middle thirds of the esophagus and Ewald believes that peptic ulcers are never located above the lower third of the esophagus.

The *treatment* of esophageal peptic ulcers Ewald conducts very much the same as he does that of gastric ulcer. At first the patient is nourished entirely by nutrient enemata, then liquid food is given by mouth and finally solid food. Ewald keeps his patients on nutrient enemata just as long as possible; the patients are weighed daily, and it is only when hunger and emaciation absolutely demand it that food is administered by mouth. Ewald believes this measure to be even more important in the treatment of esophageal than gastric ulcer, for in the case of the former every mouthful that is swallowed causes a distention of the esophagus in its entire circumference, thus preventing any rest of the affected area. Other measures that have been employed are the use of chewing gum to produce a large amount of saliva which the patient is supposed to swallow, and the administration of various astringent drugs locally applied by the use of the esophagoscope. Ewald doubts the value of either of these measures, believing in regard to drugs that the attempt at local application would produce so much spasm as to prevent any of the substance coming in contact with the ulcerated surface. After acute symptoms have subsided, some authorities recommend the systematic use of esophageal bougies to overcome any tendency to stenosis that may institute itself.

Since the above was written, an additional article on peptic esophageal ulcer by Kappis¹ has appeared. He is apparently much more critical in regard to the reported cases than was Tileston, for he admits the existence of but 14 authentic cases, to which he adds a 15th. Of these 15 cases the ulcer was the cause of death in 10, the remaining 4 patients dying of other conditions, the ulcer being found at autopsy. Of the 10 patients in which the ulcer was the cause of death, 2 died of inanition, 4 as a result of hemorrhage from the ulcer, and 4 as a result of perforation of the ulcer. In but 3 of the cases was the esophageal ulcer the only lesion in the gastro-intestinal tract; in all of the others there was some coincident gastro-intestinal disorder, and in 7 of them this was in the nature of pyloric or duodenal stenosis, or hour-glass stomach. This fact leads Kappis to the conclusion that regurgitation of gastric juice is an extremely important element in the production of esophageal peptic ulcers. Another extremely interesting fact in connection with these cases is that in 8 of the 15 there were ulcers in either the stomach or duodenum co-existing with that of the esophagus.

Cancer. Cooper² makes the following remarks in regard to examination for esophageal disease, carcinoma in particular:

1. Difficulty of swallowing is the overwhelming important symptom indicative of a lesion of, or interference with, the esophageal tube.

2. Of every 100 patients who come complaining of this symptom, from 60 to 90 suffer from malignant disease. This comprises from 5 per cent. to 6 per cent. of all carcinomas. Of persons so afflicted, over 70 per cent. are males. This raises the question whether syphilis does not play as important a role in the etiology of cancer of the esophagus as it is now believed to play in cancer of the tongue. Of these carcinomas, 10 per cent. arise in the cervical region, 40 per cent. at the bifurcation of the trachea, 30 per cent. at the lower end, while the remaining 20 per cent. are really instances of gastric carcinoma which have led to esophageal symptoms.

3. In interference with deglutition from causes outside the esophagus, difficulty of swallowing is rarely the first or only complaint, as it not uncommonly is in diseases of the tube itself.

4. The esophagus is relatively insensitive, and, therefore, severe pain is infrequent in lesions confined to its walls. The acute retro-sternal, rending pain of short duration, which most individuals have experienced upon gulping down too large a swallow of fluid too quickly, and which appears to be due to an acute stretching of a segment of the esophagus, is obviated by the slow method of taking food which these patients quickly learn to practice. Head states that the esophagus is segmentally connected mainly with the fifth dorsal segment,

¹ Mitteilungen aus den Grenzgebiet. d. med. u. Chirurg., 1910, Bd. xxi, Hft. 5.

² American Journal of the Medical Sciences, 1910, vol. cxxxix, No. 2, p. 221.

and that the two maxima brought out by passing a bougie are to be found (*a*) at a spot two inches from the middle line posteriorly at the level of the angle of the scapula, and (*b*) at a spot in the fifth interspace anteriorly about half an inch internal to the nipple line. Skin sensitiveness may be associated with these pains and overflow into the neighboring dorsal and into the cervical segments may occur. It is only during exacerbations or after the passing of instruments that we can outline these areas and skin segments, and we may conclude that severe pain commonly implies a spread of the disease beyond the esophageal wall.

5. The esophagus is not provided with location nerve terminals, and consequently the patients' fixed ideas relative to the seat of the lesion are absolutely untrustworthy. The non-appreciation of this fact has led to errors of localization. Particularly apt is he, no matter where the real lesion, to insist that the delay occurs just above the jugular fossa, as he there feels a choking sensation, perhaps because near this locality the striped constrictor muscles become continuous with the non-striped muscle of the esophageal wall.

6. Auscultation of the esophagus as a diagnostic method gives meagre information. As Hertz points out, the factors concerned in the production of the first and second sounds have been probably misinterpreted. The whole subject will bear reinvestigation, and meanwhile conclusions drawn from its findings are unreliable. The gurgling murmur clearly audible without ausculting should probably be excepted.

7. Grave organic disease of the esophagus frequently leads to disturbed innervation of the tube. The clinician who is unaware of this source of error may mistake the complication for the real lesion, and so incorrectly diagnosticate both the locality and the nature of the disease.

8. The amount of dilatation that takes place above a carcinomatous stricture is relatively small, and the regurgitation of a large quantity (above three ounces) of food from the esophagus should suggest a cause other than carcinoma. Very little dependence can be placed upon the patient's estimation of the amount he regurgitates. This must be seen and measured. Since free hydrochloric acid is often not to be found in the stomach contents of patients afflicted with esophageal carcinoma, its absence from the regurgitated food does not prove the latter to come from the esophagus. The excessive mucous secretion and the swallowed saliva frequently lead the patient to believe that he regurgitates more food than he actually does.

9. Emaciation to an extreme degree may ensue when swallowing is seriously impaired, though the lesion be non-malignant.

10. Unilateral paralysis of the vocal cords is quite a common occurrence during the course of a carcinoma of the esophagus. This may be present in the absence of any change of voice.

11. The act of swallowing is reflexly initiated by the contact of the food with the mucous membrane of the posterior portion of the tongue and the fauces. The food is thrown back into the required position by the voluntary elevation of the fore part of the tongue and the contraction of the mylohyoid muscles. In one patient with difficulty in swallowing this necessary preliminary maneuver was found to be impossible and the bismuth capsule lay motionless in the fore part of his mouth. When the bolus has reached the back part of the tongue it is no longer under control, and the involuntary reflex stage of deglutition begins. The peristaltic wave so induced can pass over any muscular block, whether caused by lesion, ligature, or section. The loss of the swallowing reflex is clinically indicative of a bilateral lesion, as either both superior laryngeal or both recurrent laryngeal nerves must be paralyzed to abolish the act of deglutition.

Cooper's statements relative to organic disease disturbing the innervation of the esophagus and thus leading to the erroneous diagnosis of a functional disorder are well worth serious consideration; I believe that this error not infrequently occurs. Another feature which sometimes leads to erroneous diagnosis, or at least, delayed diagnosis, is the inconstancy of early symptoms in organic disease of the esophagus. It is not an uncommon occurrence for the dysphagia, in particular, which appears as the first indication of an esophageal carcinoma, to suddenly disappear and remain absent for relatively long periods. Whether this is due to superficial ulceration or to the subsidence of spasm which associates itself with the organic disease, I do not know, but it does occur and does give rise to the erroneous diagnosis of hysteria or spasmodic stricture of the esophagus.

EXTENSION AND METASTASIS. Davies,¹ writing on carcinoma of the cervical esophagus, calls especial attention to the extension of the growth to the thyroid. In recent years he has had four cases of this type under his observation. In two of them the fact that the thyroïdal involvement was purely in the nature of an extension was perfectly evident. In the remaining two, however, the symptoms referable to the thyroid so overshadowed those referable to the esophagus that, without careful examination, one would be led to think that he was dealing with a primary disease of the thyroid. Occasionally other metastases from an esophageal carcinoma overshadow the primary growth quite as much as did the extensions to the thyroid in the two latter cases described by Davies. I recall one case in which the patient complained much more of distress in the region of the liver than he did of symptoms referable to the esophagus, and, while but the slightest dysphagia existed, large carcinomatous nodules could be felt on the surface of the much enlarged liver. The diagnosis, as confirmed by autopsy, was carcinoma of the

¹ *British Medical Journal*, 1910, No. 2563, p. 363.

esophagus with metastasis to the liver. In last year's article on the diseases of the digestive tract, was reported the case of a patient complaining of a nodular enlargement of the lymph glands along the sternomastoid muscle on the left side of the neck; these were supposed to be tuberculous. It was some time after the glands were removed and pronounced carcinomatous as a result of a histological examination, that symptoms were complained of referable to the original tumor, a cancer of the esophagus.

TREATMENT. Operations upon the esophagus are fraught with so many apparently insurmountable obstacles that the removal of tumors involving its wall can be considered almost an impossibility. According to Tiegel,¹ this is true of carcinomas of the upper esophagus, but surgery is already making progress in the case of carcinoma of the lower portion of the esophagus. This is to a great extent due to the improvements made by Sauerbruch in intrathoracic surgery, and to the same investigator's animal experiments in the use of the Murphy button and other means of joining the two severed ends of the esophagus, or joining the stomach to the esophagus after excising the lower end of the latter.

One of the greatest obstacles in the way of excision of esophageal carcinomas is the difficulty of separating the carcinomatous mass from the diaphragm, the pneumogastric nerves, and other neighboring tissues. Experience, however, has shown that the latter can be done, so that the difficulty can be looked upon as a purely technical one which in no wise constitutes an insurmountable obstacle. Moreover, according to Tiegel, both animal experimentation and operations on man have shown that both pneumogastric nerves can be sectioned below the hilus of the lungs without danger. (Though the latter procedure may not endanger life, it would have an important influence upon the functions of the digestive organs.) Another great difficulty is the uniting of the two ends of the esophagus, or the esophagus and the stomach after resecting a portion of the former, but that the procedure can be accomplished is well shown by a case of Henle's,² in which, aside from the tumor and a portion of the cardia, 6 cm. of the esophagus had to be resected on account of an accident in the course of the operation.

Two serious complications which must be reckoned with in operations on the esophagus are empyema and pneumonia. The danger from the former, Tiegel thinks, can be minimized by the early institution of appropriate treatment; both of these complications, however, are most unwelcome.

Many modifications of the simple removal of the carcinoma have been proposed, such as operating in two stages, performing a primary laparotomy, and doing a preliminary gastrostomy. A discussion of

¹ Münch. med. Woch., 1910, No. 17, p. 896.

² Beiträge z. klin. Chirurg., Bd. lxxv, Hft. 2, p. 315.

these topics, however, is more within the province of the article on surgery. The present remarks are made only to acquaint the physician interested in the medical aspects of diseases of the esophagus with the possibilities of radical operation in cases of carcinoma of that organ. That the removal is an actual possibility when the carcinoma is situated low down, Tiegel thinks, is proved beyond any doubt by 2 cases, the 1 of Henle's, already referred to, and 1 of Wendel's.¹ In the latter case, the extirpation of the tumor was accomplished though it had involved the lesser curvature of the stomach. The anastomosis was in good condition, when, twenty-four hours after operation, the patient died of a secondary hemorrhage. In Henle's case, the tumor and 6 cm. of esophagus which was injured in introducing the Murphy button were removed and the junction of the two segments apparently satisfactorily accomplished when eleven hours after operation the anastomosis gave way under the excessive strain and death resulted.

Davies² is more sanguine of the possibilities of operating on carcinomas situated high in the esophagus, when, by means of the esophagoscope the diagnosis is made sufficiently early in the course of the disease. From the operative standpoint, he divides carcinoma of the upper esophagus into four groups:

1. Those in which the growth extends too far into the posterior mediastinum to permit of removal.
2. Those in which a small part only of the circumference of the esophagus is involved.
3. Those in which the whole or greater part of the circumference is invaded by tumor, but the total length does not extend to more than 2 cm.
4. Those in which the length is greater than 2 cm. or there is involvement of the trachea or larynx in addition.

In the first group, radical operation is impossible. Removal in the second group is possible, but cases of this type are rarely seen. Davies mentions one case of this type in which death ensued after operation from infection in the tissues surrounding the site of operation. In regard to the third group, Davies believes that "when the growth involves the greater part of the circumference of the esophagus but has not spread beyond the outer coat, and is not more than 2 cm. in length, then it is possible not only to excise that portion of the tube with a margin of healthy tissue above and below, but also to bring the two cut ends into apposition and to suture them together." In the fourth group of cases, those in which the ends of the esophagus cannot be approximated after removal of the growth, and in which perhaps also a portion of the trachea has to be excised, the severed

¹ *Archiv f. klin. Chirurg.*, Bd. lxxxi.

² *British Medical Journal*, 1910, No. 2563, p. 363.

ends must be stitched into the wound and by means of specially devised apparatus and subsequent plastic operations, deglutition and phonation, made possible.

DISEASES OF THE STOMACH

Physiology. There has not been the wealth of investigations on the physiology of the gastro-intestinal functions during the past year that characterized the previous years. Several investigations, however, are worthy of note. Hedblom and Cannon,¹ continuing experiments along the lines that Cannon had previously used in his excellent work on the relation of foodstuffs to gastric motility, came to the following conclusions in regard to the effect of the physical condition of foods upon their discharge from the stomach:

If carbohydrate food is thinned by adding water, there is, within limits, very little change in the rate of exit from the stomach; but adding water to protein food tends to make the discharge more rapid. When hard particles are present in the food, the rate of outgo from the stomach is notably retarded. Coarse branny food leaves the stomach slightly faster than similar foods of a finer texture. The presence of gas in the stomach delays gastric discharge, an effect due to the gas preventing the walls of the stomach from exerting the normal mixing and propelling action on the food. No considerable variation from the normal rate of exit from the stomach is observed when the food is fed very hot or very cold. Food with approximately normal acidity leaves the stomach much faster than food which is hyperacid (1 per cent.), a result in harmony with other observations on the acid control of the pylorus. Feeding acid food is followed by deep and rapid peristalsis. Massage of the stomach, even when extensive, has very slight influence on the passage of food through the pylorus. Irritation of the colon (with croton oil) notably retards gastric discharge and delays the movements of food through the small intestine.

I² had the opportunity of studying the gastric functions in a little girl with complete stenosis of the esophagus and a gastric fistula, in an attempt to confirm some of the more recent results of physiological study in animals. As far as the patient was adapted to these observations I was able to a great extent, to confirm them. One of the most important deductions that I was enabled to make was, that in the pyloric mechanism the influence of the chemical reaction prevailing in the duodenum is of much more importance than that prevailing on the gastric side of the pylorus.

Gross³ had the opportunity of making observations upon a boy whose spleen was extirpated on account of rupture. He found that

¹ American Journal of the Medical Sciences, 1909, No. 451, p. 504.

² Archives of Internal Medicine, September, 1909.

³ Zeitschr. f. exp. Path. u. Therap., 1910, Bd. viii, Hft. 1, p. 169.

immediately after extirpation the peptic activity of the gastric secretion was almost entirely abolished. Later there was a reappearance with gradual increase until almost the normal was reached.

Gastric Analysis. Herschell¹ deals with the various *laboratory tests employed in gastro-intestinal medicine* in an article entitled "The Systematic Investigation of Chronic Affections of the Stomach and Intestines." With the various means at our disposal, we may determine the following facts: The length of time taken by the food to traverse the alimentary tract before it is expelled from the body; whether the fasting stomach is empty or contains substances which may afford us diagnostic information; to what extent digestion takes place in the stomach and how long food remains there; whether the pancreatic and biliary secretions are normal; whether there is evidence of pancreatitis, or of any affection of the bile-ducts; the presence of catarrh or abnormal putrefactive processes in the intestines; and whether there is bleeding into any part of the gastro-intestinal tract.

We shall consider each of these features in connection with the appropriate subjects.

The examination of the fasting stomach will, according to Herschell, frequently reveal valuable information, especially concerning the motor functions of the stomach which we cannot determine after the administration of a test meal. He divides the results obtained by this examination into four groups: (1) The stomach may be empty; (2) it may contain neutral or alkaline contents; (3) it may contain hydrochloric acid; or (4) there may be present lactic or organic acids.

1. If the stomach is empty, we are justified in concluding (*a*) that there is no considerable motor insufficiency of the stomach, thus practically excluding pyloric or duodenal stenosis; (*b*) that there is no permanent hypersecretion of gastric juice, thus in all probability excluding gastric or duodenal ulcer; and (*c*) that there in all probability exists no cancer of the stomach.

2. If the fasting stomach contains a small quantity of neutral or alkaline fluid with or without pus, blood, or infusoria, we are justified in the following conclusions: (*a*) A simple neutral or alkaline fluid containing epithelium and a few leukocytes would suggest achylia gastrica or chronic gastritis. (*b*) If pus and blood are present, and if we can exclude phlegmonous gastritis, and pus from the mouth, tonsils, post-nasal spaces, or bronchi, there is in all probability an ulcerating cancer of the stomach. (*c*) The presence of infusoria in addition to the above findings would make this diagnosis practically certain, and we should also be in a position to say that the cancer in all probability is situated upon the wall of the stomach rather than at one of the orifices. Two varieties of protozoa—the trichomonas hominis and the megastoma entericum—may be found in the stomach when the four conditions

¹ Lancet, 1910, No. 4525, p. 1401.

are present which are necessary for their existence; these are absence of HCl, an alkaline reaction, pouches or folds in the gastric mucosa, and absence of fermenting food residues. These conditions are present only in interstitial carcinoma of the stomach.

3. If the stomach contains hydrochloric acid, with or without food remnants, the following conditions may exist: (a) If there are no food remnants and the hydrochloric acid is small in amount and only occasionally present, the stomach is probably normal, as under these conditions the secretion may be quite accidental and due to some temporary irritation or psychic excitation of the gastric glands. If hydrochloric acid is invariably present or present in large amounts, there is hypersecretion of gastric juice. Such a condition may denote a neurosis, or more probably is due to ulcer of the duodenum or the irritation of gallstones, or a diseased appendix. (b) Hydrochloric acid in considerable amount with macroscopic food residues nearly always denotes an ulcer of the stomach or duodenum which has produced some amount of pyloric stenosis. (c) Hydrochloric acid with microscopic food residues may denote a benign or a beginning malignant stenosis of the pylorus, or a simple hypersecretion of central or reflex origin.

If the stomach contains food residues, together with lactic acid and possibly Oppler-Boas bacilli, we are in all probability dealing with carcinoma of the stomach. As Herschell emphasizes, Oppler-Boas bacilli are indicative only of motor insufficiency of the stomach associated with the absence of hydrochloric acid. These two conditions, however, seldom occur except in carcinoma of the stomach and especially when, in addition to the bacilli, lactic acid is present in considerable amounts, it is practically diagnostic of the existence of carcinoma.

According to Herschell, we may make the following deductions from the results of a test meal:

The presence of an abnormal amount of mucus is a certain indication of chronic gastritis.

If the amount of hydrochloric acid is found to be normal, there may be either a normal stomach, simple atony of the stomach of insufficient severity to lead to retention of food residues, pyloric stenosis not sufficient to delay materially the emptying of the stomach, or a pure neurosis. An increase of hydrochloric acid denotes either nervous hyperchlorhydria, acid gastritis, a gastric or duodenal ulcer, gallstones, or latent appendicitis. Diminution of hydrochloric acid may result from a general cachexia or neurasthenia, from chronic gastritis, or from malignant disease of the stomach. An absence of hydrochloric acid practically always denotes either the terminal stage of a chronic gastritis or atrophy of the secreting glands of either benign or malignant nature.

The estimation of the amount of pepsin and rennin has at present very little value for diagnostic purposes, as these two substances usually closely follow the amount of HCl secretion.

As a rule, the extent to which starch digestion is carried out in the stomach is in inverse ratio to the amount of free HCl present in the stomach. A rough estimation of the efficiency of proteid digestion in the stomach may be made by administering to the patient raw or slightly cooked beef and determining the presence or absence of connective-tissue fibers in the stools.

Aronson¹ contributes an article entitled "The Gastric Secretion," which, however, deals with the *results of his study of the vomitus* from 81 patients, derived for the most part from postanesthetic vomiting. The author is apparently not familiar with the recent observations of Boldyreff, Vollhard, and others, in regard to the regurgitation of bile and pancreatic juice from the duodenum into the stomach, for in speaking of the presence of bile in the stomach, he says: "We assume it is only present as a result of vomiting or in pathological conditions." His statement that his observations prevent confirmation of the claims for the value of the Salomon test is entirely unwarranted, as in his estimations of the amount of nitrogen in the stomach contents or rather vomitus, none of the conditions prescribed by Salomon were observed.

Willcox² writes a good and fairly comprehensive article on "The Diagnostic Value of the Chemical Analysis of the Gastric Contents after a Test Meal." Of special interest were the examinations of the gastric acidity of five patients before and after gastro-enterostomy, which are to be quoted in connection with treatment of gastric ulcer. In all of these cases the gastric acidity was considerably less after operation than it had been before.

Gastric Ulcer. ETIOLOGY. No very noteworthy articles have appeared during the past year dealing with the etiology of gastric ulcer. Turck,³ continuing his investigations on the relation of bacteria to gastric ulcer, makes a further report on the colon bacillus as the cause of gastric ulcer. He epitomizes the results of his experiments as follows:

1. If, in addition to ordinary meat, from 500 c.c. to 2000 c.c. of a bouillon culture of *Bacillus coli* is fed to a dog over a period of three or four months, a typical acute round ulcer of the stomach or duodenum develops, which not infrequently perforates or gives rise to fatal hemorrhage. The histological examination of such an ulcer shows neither round-cell infiltration nor any other indications of a tendency to healing.

2. If the feeding of colon bacilli is stopped for a period of six to eight weeks, the ulcer or ulcers which have formed undergo healing, the mucous membrane and glands are replaced, and the partially perforated muscle is replaced by connective tissue.

3. If, after such an intermission, a culture of *Bacillus coli* is again fed in large quantities (2000 c.c. daily) severe reactionary phenomena present themselves, such as psychosis, diarrhea, and hemorrhage. The

¹ American Journal of the Medical Sciences, 1910, No. 455, p. 233.

² Lancet, 1910, No. 4521, p. 1119.

³ Zeitschr. f. exp. Path. u. Therap., 1910, Bd. lxx, Hft. 13, p. 615.

end result of this apparently increased susceptibility is always the death of the animal.

4. If, after an intermission of several months, colon bacilli are again fed, but in small quantities and not daily, a deep chronic ulcer results.

Smith¹ takes rather a unique view in regard to gastric ulcer in considering it a diathesis. He briefly states his view as follows: "That gastric or duodenal ulcer is what we commonly term a diathesis, that is, a natural proneness of the body to a given disease, and that the actual visible ulcer itself is an acute, unusually virulent attack of the disease or outbreak of the diathesis, just as an acute attack of gout or rheumatism is an acute outbreak or attack of gout or rheumatism in a person prone to those diseases. And just as we are ignorant of why one man is more prone than another to gout—we know a good deal about what will induce an attack in one so predisposed—so we are ignorant of why one person, or indeed one sex, should be so prone to an attack of gastric ulcer, or why the duodenal form, primarily at least, should be practically the only form seen in male subjects." Few clinicians, I believe, will agree with Smith in considering gastric ulcer a diathesis because some and not all persons are subjects of the disease, or because one sex is more frequently affected than the other.

Somewhat the same attitude is taken by Czernecki² on the basis of his observation of three cases of gastric ulcer in one family. The family consisted of a mother and four children all of whom, according to Czernecki's description, were subjects of the habitus asthenicus. All five suffered more or less with gastric disorders, and in three of them gastric ulcer, with stubborn bleeding, could be diagnosticated.

GEOGRAPHICAL VARIATIONS. The geographical variations in the frequency and symptomatology of gastric ulcer are very interesting. For instance, the following table of the frequency of gastric ulcer in various cities and countries is quoted from Obendorfer:³

	Per cent.
Denmark (Dahlerup)	13.0
Jena (Müller)	11.0
Kiel (Greiss)	8.32
Kiel (Cohn)	6.05
Berlin (Plange)	8.0
Berlin (Steiner)	4.0
Berlin (Wollmann)	4.0
Prag (Willigk)	4.6 to 5.30
England (Chambers)	2.0 to 3.50
Breslau (Waldeyer)	1.98
Munich (Nolte, 1876 to 1883)	1.23
Munich (Scheuermann, 1883 to 1894)	1.44
Munich (Schädel, 1894 to 1902)	1.38

¹ British Medical Journal, 1910, No. 2568, p. 673.

² Wiener klin. Woch., 1910, No. 18, p. 661.

³ Münch. med. Woch., 1909, No. 32, p. 1640.

These statistics form the basis of the claim that gastric ulcer is more common in the north of Germany than in the south. However, that the estimated frequency depends materially upon the care with which the stomach is examined, and especially upon the diligence with which the search for scars is prosecuted, is demonstrated by the statistics of Obendorfer for Munich from 1901 to 1908 inclusive, which show gastric ulcer to have occurred in 7 per cent. of 3412 cases at autopsy. The statistics of Nolte, Scheuermann, and Schädel quoted above, show an average of 1.35 per cent. for the frequency of gastric ulcer in Munich. The enormous discrepancy between these statistics and those of Obendorfer is undoubtedly dependent upon the fact that scars of gastric ulcer were diligently sought for in the material forming the basis of the latter's statistics, while only the more evident ulcers were included in the statistics of the former observers. Among the cases collected by Obendorfer are undoubtedly many which were entirely latent and did not permit of clinical recognition. This observation is substantiated by a comparison of Obendorfer's statistics with the clinical statistics of Crämer,¹ who, between the years 1901 and 1907, diagnosticated probable gastric ulcer in 3.8 per cent. of 5000 cases. An interesting feature of the clinical statistics of Crämer, as well as the pathological statistics of Obendorfer, is that males and females were affected with equal frequency. A further observation of Crämer's was that in the Bavarian mountains gastric ulcer is by no means of infrequent occurrence. It has been claimed by v. Sohlern² that gastric ulcer is of extremely infrequent occurrence in these regions. In answer to Crämer's refutation of this claim, v. Sohlern³ says that the difference in the two observations is probably dependent upon the changes in the life habits of the people of the Bavarian mountains that have developed during the latter years as a result of the influx of tourists into these regions.

Obrastzow⁴ calls attention to the remarkable infrequency of gastric ulcer in Russia. Winogradow,⁵ in 900 autopsies in the Obuchow Hospital in St. Petersburg, found but one or two ulcers. Petersen, in the Alexandra Hospital, found but three ulcers in 6000 autopsies. According to Lipsky,⁶ among 156,566 patients admitted to the Hospitals of St. Petersburg in three years, there were 11,644 with disturbances of the gastro-intestinal tract; but 66 of these were cases of gastric

¹ Münchener med. Wochenschrift, 1909, No. 32, p. 1637.

² Berliner klinische Wochenschrift, 1889, p. 272.

³ Münchener med. Wochenschrift, 1909, No. 48, p. 2486.

⁴ Internat. Beiträge z. Path. u. Therap. d. Ernährungsstörungen, 1909, Bd. i, Hft. 1, p. 111.

⁵ Quoted by Krupetzky, Dissertation, Dorpat.

⁶ Erkrankung u. Mortalität. Statistik der Bevölkerung in St. Petersburg für die Jahre, 1890, 1891, und 1892.

ulcer. An official report of Moscow for the years 1892, 1893, and 1894 shows 138,443 patients to have been admitted to nine hospitals. Of these patients, 8263 suffered with some gastro-intestinal disorder, 134 being subjects of gastric ulcer.

According to Obrastzow's statements, the frequency of gastric ulcer at autopsy in all of Russia is but 0.14 per cent., an extraordinary small figure. Parts of Russia, however, show a greater frequency, for instance, in the medical clinic in Dorpat, 1258 patients were admitted between September 1, 1892, and June 1, 1896. Of these, 227 suffered with some gastro-intestinal disorder, 45 of which were cases of gastric ulcer. The statistics of the Pathological Institute of Dorpat show the occurrence of ulcer to be 3.1 per cent.

Obrastzow sees a possible explanation for the striking infrequency of gastric ulcer in Russia in the almost exclusively vegetable diet of the masses of the people, the peasants and the laboring classes. He, moreover, finds substantiation for this view in the fact that according to his personal observations among the wealthier classes in Russia and among those who partake of the same food as the wealthier classes—cooks, waiters, and household servants—gastric ulcer is of relatively frequent occurrence. In his experience, moreover, gastric ulcer in Russia shows no racial preference. In the past five years in the University clinic in Kief there were 9 cases of gastric ulcer in Russians proper, 9 in Poles, and 11 in Hebrews. In his private clinic during the past three years there were 17 cases in Russians and Poles, and 25 in Hebrews.

Obrastzow's explanation for the infrequency of gastric ulcer as a result of the vegetable diet of the Russian people is probably not correct, for in the first place gastric ulcer is not always associated with hyperchlorhydria, and in the second place, Crämer, in the article above quoted, calls attention to the fact that there are some regions in Germany, for example Oberhessen, where an almost exclusively vegetable diet is eaten and where, according to Riegel, hyperchlorhydria is of frequent occurrence as is also gastric ulcer. Similarly, he calls attention to the fact that in the neighborhood of Mindelheim, in Bavaria, the people eat almost exclusively a vegetable diet, and gastric ulcer is an unusually common disease. It cannot but suggest itself to one that errors in diagnosis may be responsible for such an extraordinarily small percentage of cases of gastric ulcer as the Russian observers have found, and that a lack of critical care in the pathological examination of stomachs for scars and small ulcers may be responsible for the reports based on pathological data.

The geographical variations in the symptomatology of gastric ulcer are quite as striking as are the variations in the incidence of the disease. Cohnheim,¹ apparently on the basis of the characteristics manifested

¹ *Die Krankheiten des Verdauungskanaals*, p. 77.

by gastric ulcer in Berlin, states that the disease cannot be diagnosticated unless epigastralgia be present. According to Crämer¹ and Kayser,² if gastric ulcer could not be diagnosticated without epigastric pain, very few cases of gastric ulcer would be diagnosticated in Munich. It is remarkable that two observers should call attention to the striking infrequency of such an important symptom in a particular locality, and this undoubtedly indicates a geographical peculiarity of the disease. According to Kayser, hyperacidity is another symptom which is remarkably and infrequently associated with gastric ulcer in Munich, for they both find it to be an infrequent symptom. In Müller's clinic for the years 1906, 1907, and 1908, of the cases of gastric ulcer which were subjected to gastric analysis, 34 per cent. showed hypoacidity, 52 per cent. normal acidity, and 13 per cent. hyperacidity. In undoubtedly close relationship to this finding are the observations of the relative infrequency of hyperacidity in general, in Munich, by Meyer³ and Deutschmann.⁴ In the years 1906, 1907, and 1908, the gastric analysis of 104 patients suffering from some gastric disorder other than ulcer or cancer, showed hypoacidity in 33½ per cent., normal acidity in 36½ per cent., and hyperacidity in 30 per cent. Kayser thinks that the infrequency of the occurrence of pain in cases of gastric ulcer in Munich is dependent upon the infrequency of hyperacidity as an associated symptom. Kayser found, moreover, as did Crämer and Obendorfer, that males and females were about equally affected. In judging of the geographical variations in the symptomatology, it must not be forgotten that clinicians in one locality may be much more exacting and much more critical in their diagnosis than those in another locality; and what in one region may be diagnosticated an ulcer without pain would in another be diagnosticated a different gastric disorder. In regard to the finding of Kayser of the relative infrequency of hyperacidity as a symptom of gastric ulcer, many observers in other localities have noted the same, and most clinicians no longer look upon hyperacidity as an essential symptom of gastric ulcer.

TREATMENT. Nothing very new in the treatment of gastric ulcer has appeared during the past year though a number of articles have been published dealing with the advantages of the various plans of treatment that are at present in vogue. Probably the first systematic plan of treatment for gastric ulcer was the *milk diet* recommended by Cruveilhier and Brinton. Somewhat later, Ziemssen and Leube instituted the combination *rest and diet cure*, which has for many years been the most accepted method of treatment. One of the incidental elements of this plan of treatment was the administration of *Carlsbad*

¹ Loc. cit.

² Münchener med. Wochenschrift, 1909, No. 49, p. 2515.

³ Ibid., 1908, No. 16, p. 880.

⁴ Inaug. Dissert. München, 1908.

salts. Later, Fleiner¹ recommended, in place of the Carlsbad salts, large doses of *bismuth subnitrate* which is supposed to serve as a coating for the ulcer and so to mechanically protect it.

The *Leuhartz treatment* was then instituted, a full description of which is given in the article on diseases of the digestive tract in *PROGRESSIVE MEDICINE* for 1908. The originator of this method of treatment attempted to overcome the inanition of his patients and at the same time give sufficient rest to the stomach by giving a moderate quantity of milk and eggs as soon as treatment is instituted. This he does regardless even of extensive hemorrhages. The amount of food is then rapidly increased so that by the seventh day the patient is taking 1600 calories. The actual figures for the caloric values of the food administered during the first fourteen days are as follows: 280, 420, 637, 777, 956, 1135, 1588, 1721, 2138, 2478, 2941, 2941, 3007, 3073.

Senator² attempts to combine the advantages of the Leube and the Leuhartz cures by giving a diet consisting of milk, almond milk, soup, small bits of butter, eggs, and ice, and, what he considers the most important element of his treatment, *gelatin*. The latter is given in the form of wine jelly, or jellied broths in quantities of a tablespoonful every three hours or oftener. According to Senator, the gelatin calls for little work on the part of the stomach, saves the body proteids, and also acts as a stypic.

The *atropine treatment*, for which so much is claimed by its most ardent supporter, v. Tabora, was detailed in last year's volume on Diseases of the Digestive Tract. A special form of treatment, for which much is claimed by Cohnheim³ and Walko,⁴ is the *olive oil* or *almond oil treatment*. The advantages of this treatment are claimed by its supporters to be dependent upon the reduction in gastric acidity and the mechanical protection to the ulcer afforded by the oil. Walko administers the oil at first in teaspoonful doses and from the second or third day on in doses of 50 c.c. three times daily. If the patient cannot overcome the distaste for the oil, 100 c.c. to 200 c.c. are introduced into the stomach by means of the stomach tube once daily. Later, a regulation Leube cure is instituted. Both Cohnheim and Walko claim excellent results for this method of treatment and contend that cures result much quicker than with other methods. However, the difficulty that most patients experience in attempting to swallow large doses of oil will undoubtedly serve as a decided drawback to its being more universally adopted as a method of treatment. Klemperer⁵ looks

¹ Verhandlungen d. No. 20 Kongresses f. innere med., Wiesbaden, 1902.

² Deutsche med. Wochenschrift, 1906, No. 3.

³ Zeitschrift für klinische Med., 1904, Bd. lii, p. 110.

⁴ Wiener klinische Wochenschrift, 1907, No. 47.

⁵ Therap. d. Gegenwart., 1907, No. 5.

upon "*escalin*," an *aluminum glycerin paste*, as an excellent substitute for bismuth in the treatment of gastric ulcer, possessing the advantage of not tending to intoxication when given in large doses over a long period of time.

In spite of this rather extensive number of plans of treatment for gastric ulcer, the vast majority of cases are treated according to either the Leube or the Lenhartz methods, or slight modifications of them, and it is in the relative merits of these two plans of treatment that we are especially interested. It must be borne in mind, however, that in attempting to draw comparisons of the relative merits of different plans of treatment, statistics are often misleading for there are great variations in the selection and classification of cases as a result of the personal expression of the individual observers. It is, moreover, extremely difficult to find even an approximate uniformity of opinion as to what constitutes a cure in gastric ulcer.

According to Lenhartz, an ulcer can be looked upon as healed when, after repeated examinations, occult blood is no longer present in the feces. According to Wagner,¹ an ulcer is healed when bleeding has ceased; when pain after eating, tenderness, and vomiting have disappeared; when the hemoglobin is approximately normal, and when the patient's weight is approximately that which it should be for his height. Leube² considers those patients as cured in whom all symptoms referable to the stomach have disappeared, and who are able to take a full diet without any discomfort. Pariser³ takes the peculiar position of considering only those patients cured who no longer have a dorsal point of tenderness. He claims to find this point of tenderness in practically all ulcer patients and estimates that 95 per cent. of ulcer patients have the ulcer on the posterior gastric wall. As most other clinicians do not find the dorsal point of tenderness to be present in more than 30 to 50 per cent. of cases, Pariser's criterion of cure can hardly be taken seriously. Lüdin⁴ considers as cured such patients as can take a full diet without symptoms and who are strong enough to remain out of bed several hours a day without discomfort.

Despite this variance of opinion as to what constitutes a cure from gastric ulcer and the differences that prevail in classification, the observations and statistics of careful clinicians are of value, and undoubtedly when a sufficiently large number of them are on record they will serve as a reliable index of the value of the various methods of treatment. Wirsing,⁵ comparing the results of treatment by the Leube and the Lenhartz methods, came to the conclusion that the recurrences of hemor-

¹ Münchener med. Wochenschrift, 1904, No. 1.

² Deutsche med. Wochenschrift, 1909, No. 22.

³ Ibid., 1902, Nos. 15 and 17.

⁴ Archiv für Verdauungskrankheit., 1910, Bd. xv, Hft. 6, p. 671.

⁵ Ibid., 1905, Bd. xi, p. 197.

rhage were relatively and absolutely fewer in the Lenhartz treatment than in the Leube treatment. Ewald,¹ as a result of his experience, gives the preference to the Leube treatment in cases in which hemorrhage is not a prominent feature. Minkowski² was unable to convince himself that with the immediate administration of milk and eggs after a hemorrhage, considering the relatively small caloric content of the amount administered, much is accomplished; aside from this fact, however, he was well pleased with the result of his treatment of 30 cases by the Lenhartz method.

Two articles dealing with the relative merits of the two methods of treatment under discussion have been published during the past year. One of them by Mayerle³ the other by Lüdin.⁴ Mayerle, as a result of his treatment of 71 patients with the Lenhartz method, feels that the claims made by the originator of that method are thoroughly justified. His results are as follows: In 46 cases (65 per cent.) there was uninterrupted recovery requiring on the average six and three-quarter weeks, with an average gain of slightly over nine pounds (German); in 8 cases (11 per cent.), delayed healing without relapse, and in 10 cases (14 per cent.), delayed healing with relapse; in 7 cases (10 per cent.), a cure was not accomplished, but in 5 of these cases the prescribed diet could not be borne. In 3 cases (10 per cent. of the hemorrhagic cases), there was recurrence of hemorrhage. Mayerle was unable to see that any harm was done to any of the patients by the Lenhartz treatment even when it was started immediately after hemorrhage.

Lüdin compares the results of treatment by the Lenhartz method, as practised in Gerhardt's clinic in Basel during the past two years, with the results obtained during the preceding two years when the Leube treatment was used; 45 patients were treated according to Lenhartz, and 55 according to Leube. Lüdin concludes from a comparison of these series that in hemorrhagic cases there is no preference in either method, though in such cases, especially those in which the patients are much emaciated, he thinks it worth while trying the Lenhartz treatment first, for as Leube has recently admitted, with the Lenhartz treatment we can frequently make much more rapid strides than with any other mode of treatment. He thinks it well, however, in hemorrhagic cases, to precede the institution of the treatment by several days of rectal feeding if a hemorrhage has occurred shortly before treatment is commenced. In the subacute cases, those in which hemorrhage has not been a prominent factor, Lüdin concludes that the Leube treatment is much to be preferred. His statistical results

¹ Die Deutsche klinik am Eingange des 20 Jahrhunderts, Bd. v, p. 501.

² Medizinische Klinik, 1905, No. 52.

³ Archiv für Verdauungskrankheiten, 1909, Bd. xv, Hft. 3, p. 337.

⁴ Ibid., Hft. 6, p. 671.

are as follows: Of the cases in which bleeding was demonstrable, 70.5 per cent. were cured by the Lenhartz method, 75 per cent. by the Leube method; of those in which there was a history of bleeding, but none demonstrable when the patient came under treatment, 62.5 per cent. were cured by the Lenhartz treatment, 92.3 per cent. by the Leube treatment; of those in which there was no history of bleeding and in which no blood was demonstrable when the patient came under treatment, 66.6 per cent. were healed by the Lenhartz treatment, 83.3 per cent. by the Leube treatment. With the Lenhartz treatment the average time that the patient was confined to bed was 25.1 days, the average time that he remained in the hospital was 39.6 days; with the Leube treatment the average time in bed was 19.48 days, the average time in the hospital, 40.34 days. Lüdin also had the opportunity of comparing the length of time two of his patients remained under treatment, first with the Leube cure and later, for relapse, with the Lenhartz cure. One patient under the Leube treatment was confined to bed for twenty-five days and was cured in forty days; in the relapse, when treated by the Lenhartz method, she was confined to bed for twenty-four days and cured in fifty-one days. The second patient treated by the Leube method was confined to bed for nineteen days and left the hospital cured in fifty-eight days; under the Lenhartz treatment she was confined to bed for thirty-three days and left the hospital cured in eighty-three days. The length of time that the second patient remained in the hospital was partly due to the complicating severe anemia for which she was being treated.

Before discussing the relative merits of these forms of treatment, let me quote the following remarks from an article by Spriggs¹ which I think will materially aid in an understanding of the dietetic principles upon which these treatments are based:

"The stomach contains an unhealed wound, and very often an eroded bloodvessel loosely plugged with newly formed clot. It also produces an acid digestive ferment capable of irritating the ulcer and dissolving the clot; further, the patients who are most liable to gastric ulcer produce this digestive juice abundantly.

"We ought not to speak of hyperchlorhydria, if by that is meant a higher proportion of hydrochloric acid in the gastric juice, because it is probable that the percentage of acid in the secretion never rises much above about 0.4, which may be regarded as a normal figure. When pure gastric juice has been obtained from a fistula in man the proportion of hydrochloric acid has been, as in animals, surprisingly constant. That proportion may be depressed in disease, but the evidence is wanting that it can be much raised.

"There are, however, three ways in which the total amount of acid, as distinguished from the percentage, in the stomach may be increased.

¹ British Medical Journal, 1910, No. 2577, p. 1216.

"1. By hypersecretion of juice. This was observed by Pawlow to take place in a dog who developed a gastric ulcer in a small accessory stomach made by operation from the normal stomach. During the formation of the ulcer there was a continuous secretion of three or four times the normal amount of juice.

"2. By any interference with the natural discharge of the stomach contents. The pylorus has been shown to open as soon as a certain proportion of free acid is present in the stomach; the time which elapses after a meal before the food begins to leave the stomach will, therefore, vary with the nature of the food. Protein will take up a good deal of acid, and its affinities must be satisfied before acid appears free in the mixture of food and secretion, and stimulates the pylorus to open. Carbohydrate, on the contrary, does not take up acid, and therefore, if the meal is chiefly starchy, the acid of the gastric juice is not neutralized and the pylorus opens earlier. We see, then, that if this mechanism is interfered with, as, for instance, by an ulcer near the pylorus, which may be supposed to render the musculature of the pylorus unduly irritable, the pylorus would not open at the proper time, and instead of the acid juice passing on into the small intestine to be neutralized, it would accumulate in the stomach. It is probable that such interference with the motor functions of the stomach is often responsible for the so-called hyperacidity.

"3. The total amount and percentage of free acid may be raised by the fermentative production of organic acids. In this way the percentage of total free acid, but not, of course, of hydrochloric acid, may be higher than about 0.4; indeed, the total acidity may be equivalent to 0.6 or 0.7 of hydrochloric acid. Fermentation is most likely to occur as a result of deficient motor activity of the stomach.

"The dietetic treatment adopted depends upon the view taken of the relative importance of the above-mentioned conditions in the stomach. If the most urgent requirement is to protect the ulcer from all contact with foreign material, whether fluid or semisolid, then no food at all must be given by the mouth; if, on the other hand, the harm is done by the gastric juice, then means must be used to prevent its secretion or to neutralize its activity after it has been secreted.

"If we could be sure that the withholding of food by the mouth would be followed by the cessation of gastric secretion, the course to be taken would be plain, but we do not know this. It is true that the normal stimulus to the secretion is a meal, but the flow begins before food is sent into the stomach, for the thought of food is sufficient to arouse it, and the hungrier the patient the more likely is such a thought or any stimulus to call forth secretion. Further, I have already mentioned that the ulcerated stomach is prone to hypersecretion of juice, and several observers have reported that the administration of a nutrient enema which is associated by the patient with the idea of food does

excite the production of gastric juice, and one of them has actually observed this in a patient with a gastrostomy wound.

"If then we cannot be sure that starvation really secures the ulcer from all irritation, we may turn to see what means may be employed to neutralize the gastric juice and to lessen its secretion. When the etiology of the gastric and duodenal ulcer is considered, it is evident that this course is a reasonable one, for these ulcers only arise in those parts of the mucous membrane which are exposed to the action of the gastric juice. Dr. C. Bolton has shown that the ulcers which follow the injection of 'gastrotoxic serum' into the peritoneum in guinea-pigs are not formed if the activity of the gastric juice is arrested by neutralization. It is the digestive power of the acid secretion which is the immediate cause of the ulcer, and appears to be the chief factor in preventing it from healing.

"The gastric juice may be neutralized and thus rendered harmless by giving protein and by giving alkalies. Both these methods are useful, but the former has the advantage that food is being supplied, which, when it has been passed on into the intestine, will be absorbed and nourish the patient.

"Another plan which may be adopted is that of mechanically draining off the gastric juice and the food from the stomach by means of a gastrojejunal fistula. This operation is effectual in cases of ulcers at the pyloric end of the stomach, but it is less likely to be so in those at the cardiac end. I have seen recently a case in which a later operation showed that an ulcer in the cardia had leaked and become adherent to the abdominal wall after a gastrojejunostomy had been performed.

"The secretion of juice may be lessened or inhibited by giving fat, which again is a valuable food; indeed, from one point of view, that of the heat value, the most valuable of the three foodstuffs.

"Leaving now the discussion of the local condition in the stomach let us consider the general nutrition of the body. This is undermined in many cases by a long period of dyspepsia suffered by the patient before an ulcer had formed or was recognized. Some patients are, however, well covered, but these are commonly anemic, and anemia has been shown to delay the healing of ulcers in the stomach. There is no danger to life in withholding food altogether for a few days or even two or three weeks in fairly stout people, provided that fluid is supplied freely. In the emaciated, however, such a proceeding cannot fail to be harmful. It is true that food can be given per rectum, and under favorable conditions about half the needs of the body can be supplied in this way. It is seldom, however, that the absorption of this amount of food can be continued for more than a few days. We must remember that only a part of what is introduced into the sigmoid is really absorbed, and, in the average case, only a small part. We

cannot, therefore, regard rectal feeding as anything but a temporary makeshift, valuable though it may be in a few individual cases.

"The injection of oil under the skin has been practised, but in the only cases that I have found in which its effect has been estimated by a metabolism experiment it appeared that but little, if any, of it was oxidized, and in one patient unused oil was found lying in the body spaces after death."

The first systematic plan of treatment for gastric ulcer, the restriction of the patient to a limited milk diet, was calculated to rest the stomach, but it paid no attention whatever to the state of the patient's general nutrition. The Leube treatment was calculated to give the patient a fair amount of nutrition and at the same time to rest the stomach, both by the preliminary several days of rectal feeding and by the subsequent diet which was supposed to call for little activity on the part of the stomach and to excite the secretion of but little gastric juice. The Lenhartz treatment attempts to furnish a diet that fulfils three objects: (1) To call for the secretion of but little acid juice; (2) to readily combine with the acid that is secreted; (3) to nourish and strengthen the patient rapidly.

As to how important a factor a highly acid gastric juice is in the production of gastric ulcer it is impossible to say. According to the experiments of Bolton mentioned above by Spriggs, it plays a very important role in their formation. I think there can be little doubt from both the experimental and clinical view-points that the secretion of a highly acid gastric juice does at least seriously retard the healing of an ulcer. The principal elements of the Lenhartz diet for the first week are eggs and milk. As was shown by Pawlow in his experiments on animals, and as I was able to demonstrate on my patient with a gastric fistula, egg albumin calls for the secretion of a minimum amount of acid juice, practically no more than does an equal amount of water. Furthermore, the fat in the yolk of the egg would have the tendency to inhibit the secretion of acid as it has been repeatedly demonstrated that fats possess this property. Similarly, milk has been shown to excite the secretion of but a slightly acid juice. It is difficult from the evidence at hand to decide as to the influence upon the secretion of acid that the scraped beef has which is introduced into the diet at the end of the first week. It has been shown both in animals and man that meat extractives are the most powerful chemical stimulants to the secretion of gastric juice that we possess. We do not know, however, that the same applies to whole meat. Schüle,¹ as a result of his investigations on the normal stomach, concluded that the various types of food had little influence on the acidity of the juice secreted, and Sorensen,² studying the influence of the different foodstuffs on patients

¹ *Zeitschrift für klinische Med.*, Bd. xxviii and xxix.

² *Münchener med. Wochenschrift*, 1898, 36.

with hyperacidity, came to the same conclusions. On the other hand, Hemmeter¹ observed the total acidity to be greater after the administration of proteid food than carbohydrates, and was able to induce hyperacidity in animals by giving them an exclusively proteid diet. Fleiner, in his text-book, says that "milk foods and light cereals in pure form excite the production of much less gastric juice than do proteids."

Whether it is by reason of the supposedly small amount of acid juice secreted or by reason of the tendency of the proteids to combine with a large amount of acid, the majority of patients on the Lenhartz treatment, according to Mayerle, are not bothered by symptoms referable to hyperacidity. In 46 of his patients a gastric analysis was made, and in 18 of these hyperchlorhydria was found. In 12 of these 18 patients, the diet was apparently efficient in controlling the hyperacidity. In 4 of the remaining patients, considerable doses of alkali had to be administered to control the symptoms dependent upon the hyperacidity. In 1 of the 2 remaining cases the diet apparently induced hyperacidity sufficient to do definite harm to the patient. Before treatment was instituted a gastric analysis showed the acidity to be scarcely above normal. On the fifth day of the Lenhartz treatment symptoms of violent hyperacidity occurred followed immediately by a distinct relapse with bloody vomiting in which an excessive amount of free acid was found to be present. The diet was changed to one rich in fats, milk, and starches, and the patient immediately improved. Subsequently on two occasions small amounts of meat were given and each time symptoms of hyperacidity recurred.

Mayerle found, further, that patients with low total acidity and little or no free acid did less well on the Lenhartz diet than those with higher acidity. This is easily understood when it is recalled that the digestion of proteid food in the stomach requires a relatively large amount of acid. In these cases Mayerle found that a diet according to Senator's or Ewald's² suggestions was much better borne.

The third purpose of the Lenhartz treatment, that of rapidly nourishing the patient, is theoretically perhaps the most important, yet Lüdin contends that this object is not consistently fulfilled and that it does not accomplish its purpose in this particular any better than does the Leube treatment. He found that of 18 patients on the Lenhartz treatment whose weight was observed during the first fourteen days of treatment, 5 lost in weight, whereas of 21 patients on the Leube treatment whose weight was taken during the first fourteen days only 3 showed a loss. As all of these patients soon regained their lost weight Lüdin does not think that the loss during the first week or two is of much consequence, so that the claims of superiority of the Lenhartz

¹ Archiv für Verdauungskrankheiten, Bd. iv.

² Deutsche med. Wochenschrift, 1905, No. 9.

treatment in this particular he does not think are justified. To demonstrate that even the Lenhartz treatment signally fails to combat the inanition occasionally met in gastric ulcer, Lüdin recites the following case:

A woman, aged twenty years and previously healthy, was suddenly taken with vomiting of blood in December, 1908.

January 2, 1909, there was repeated hematemesis; the patient was very much depressed and had little appetite. The Lenhartz cure was instituted.

January 12, 1909. Until two days ago patient was doing fairly well. Since then she has been depressed, indifferent, very pale and according to her statements, at times unable to see. Pulse small, weak, and rapid. Cardiac dulness normal. Abdomen retracted, stomach somewhat protruded, right iliac fossa somewhat resistant and dull. Mentally stupid. Blood examination showed a considerable decrease in the number of red blood corpuscles and leukocytes, and a moderate poikilocytosis. The stained preparation showed the increase in the leukocytes to be almost entirely polynuclear; lymphocytes and eosinophiles very scarce; no normoblasts or other pathological forms.

January 13, 1909. Death. The autopsy revealed marked anemia of all organs. On the lesser curvature of the stomach a small ulcer apparently not bleeding; microscopic examination of the ulcer revealed no eroded vessel; apparently no blood in the intestinal lumen. Beginning pneumonia, which the pathologist looked upon as agonal and not as the cause of death for which Lüdin thinks the inanition must be held responsible.

Another objection to the Lenhartz treatment that Lüdin records is the extreme distaste for eggs which the patients soon develop when obliged to take so many of them. In three of his patients the diet had to be changed on this account. Mayerle had the same experience and had to alter the diet in twelve of his cases. The two observers, moreover, found that many patients could not take the raw meat which forms an element of the diet after the first week. Most patients, however, were able to take it with perfect ease when it was slightly broiled.

A more serious objection to the meat is the confusion that it leads to in testing for occult blood in the stools. This necessitates either frequent interruptions in the diet or the discarding of examinations for occult blood. A further complaint on the part of both Mayerle's and Lüdin's patients was the extreme thirst which they suffered, apparently the result of the sugar added to the diet on the third day. Mayerle found that enemas of a half liter of normal salt solution once or twice a day entirely overcame this thirst.

As an indication of the rapid general improvement on the Len-

hartz treatment, Wagner¹ calls attention to the increase in the hemoglobin. Unfortunately, Mayerle and Lüdin did not make very complete observations of the condition of the blood in their series of patients, but the latter observer mentioned that in 7 cases under the Leube treatment there was an increase in hemoglobin in 5, whereas in 9 cases treated according to Lenhartz there was an increase noted in but 4. According to Lenhartz's directions, Blaud's pills may be prescribed after the seventh or eighth day of treatment. The patients to whom Lüdin gave iron so early in the treatment complained so much of pressure and pain in the stomach that this form of treatment had to be discarded. Mayerle was in the habit of giving his patients arsenic hypodermically during the earlier stages of treatment, later prescribing iron by the mouth.

The *medicinal treatment* employed by Mayerle consisted of moderate sized doses of bismuth during the first few weeks. Usually about the third week bismuth subnitrate and magnesia usta in equal parts were given; later the proportion of these two drugs were altered so that one part of bismuth to two of magnesia were taken. In those cases in which symptoms of hyperacidity were marked, equal parts of bismuth subnitrate and anesthesin were administered, and later, with even better results, equal parts of bismuth subnitrate and ammonio-magnesia-phosphoric acid, or the latter in combination with equal parts of magnesia usta. He also found that the compound magnesia recommended by Ewald² was very serviceable, especially in the chronic cases with hyperchlorhydria. A disadvantage in the administration of these drugs as compared with Carlsbad salts is the fact that with them enemas must be continued for quite a time.

When we consider the various methods of treatment for gastric ulcer which have been used by various men at different times, always with more or less success, we must recognize that there is some element common to all of these forms of treatment, which consists in neither diet nor medication. Spriggs³ recognizes this, for in the article above quoted, he says: "There are now several large series of cases treated on divergent principles, all showing a low mortality with a large proportion of successes. In these series we note that when one observer has made use of one method, he has usually attained success; this I interpret to mean that success does not depend upon the particular method so much as upon the care and prudence with which it is carried out. Men do well what they do often."

I think this must be especially recognized when we compare the results of two such radically different forms of treatment as the Lenhartz treatment, and the treatment which was, until a short time ago,

¹ Münch. med. Woch., 1904, p. 1.

² Deutsche Klinik, Bd. v.

³ British Medical Journal, 1910, No. 2577, p. 1216.

the prevailing one in England. This treatment is described by Spriggs as follows:

"The patient is kept in bed, and, if the hemorrhage is recent, nothing whatever is given by the mouth—not water nor ice to suck; the mouth is washed out repeatedly with antiseptic solution, and bismuth lozenges are given to suck. An ice bag is placed over the stomach. A nutrient enema is given three times a day at intervals of six hours. . . . The length of time that enemas should be continued is differently fixed by different physicians; some, after a severe hemorrhage, or with a chronic ulcer, continue them for two or three weeks. Probably ten or fourteen days is enough. After five or six days small quantities of milk may be given by the mouth, say two or three ounces every two hours, increased gradually to four or six ounces at a feeding. Each feed must be taken slowly in sips. If pain is caused, ten grains of sodium bicarbonate may be given with the milk. After the tenth day a little bread and milk, or milk boiled with flour, is allowed and the enemas discontinued. Arrowroot, tapioca, sago, and ground rice are now added to the milk with one-half ounce of plasmon. Bread and butter, rusks, eggs, and milk puddings follow. After four weeks or, according to some physicians, not until the sixth week, pounded fish or boiled calves' brain, or very underdone scraped meat is carefully tried."

It is remarkable that after treating a series of patients according to this unusually strict régime and another series according to the Lenhartz method, Spriggs should conclude:

1. That the Lenhartz method of treatment is not more dangerous than treatment by nutrient and saline enemas, followed by a graduated milk diet. In these particular cases the recurrence of hemorrhage was less frequent, and there were no deaths.

2. That the pain suffered by the patient in the course of treatment is less on the Lenhartz diet.

3. The diet gives far more nourishment than can be introduced into the body by nutrient enemas, and is therefore more desirable in patients who have frequently been for a long time in a state of semistarvation, or have suffered a loss of blood, or both.

4. That in cases treated by this method, rectal injections may be entirely avoided. This is an advantage in a hospital, and a still greater advantage in treating cases at their homes, where rectal injections are not only regarded as extremely unpleasant, but are seldom efficiently administered.

Conclusions such as these from the use of two such radically different dietetic methods of treatment compel us to look for some other factor than the diet to account for the success of the treatment. It is possible that this is to be found in the mere fact that treatment along any recognized lines forces the patient to eat much less food, and food of a more

readily digestible character than he previously ate. It is my belief, however, that the rest to which the patient is subjected is an extremely important factor in the success which various men meet in the treatment of gastric ulcer by the different methods in vogue. Spriggs is firmly convinced of the importance of rest, and expresses himself as follows:

“In accordance with the teachings of the English physicians of the last century, I believe that the most important point in the treatment of gastric ulcer is to insure complete and prolonged rest in bed. It has been my lot to treat cases in the out-patient department who would not or could not lie up entirely, and to see patients in better circumstances, who have remained up and about against advice. Dietetic and medicinal treatment will relieve such but seldom cure them. On the other hand, I have seen cases in bed treated in many different ways with good results. From these observations the conclusion may be drawn that complete rest is a factor without which all other treatment is likely to be disappointing. I have no doubt that the absolute rest and simple diet enforced after an operation has a great part to play in the relief afforded. If operations for gastric ulcer were arranged at the end of three weeks in bed, instead of at the beginning, they would, in not a few instances, be postponed indefinitely. I need not dwell longer on the importance of rest, and should have not said so much about it did I not know how many people there are walking about with gastric and duodenal ulcers who could be cured if they went to bed for a month, or even a shorter time. The rest in bed should be absolute; no getting out or sitting up, and as little rolling over as possible. The indications for complete rest are still more stringent when there has been a recent hemorrhage; the patient should not move from the supine position for ten days.”

Treatment of Hemorrhage. Severe hemorrhage from gastric ulcer is a condition which is usually as alarming to the physician as to the patient. Fortunately, fatal bleeding, according to the statistics of men who have observed large numbers of cases, is a comparatively rare occurrence. Fenwick¹ states that death due to uncontrollable hemorrhage has occurred in 3.4 per cent. of his cases; Leube² and Jacoby³ both estimate that 1 per cent. of their gastric ulcer cases died of hemorrhage; Ewald⁴ states that in his large experience he has never seen a death caused directly by profuse hemorrhage. Other observers figure between 3 and 5 per cent. of ulcer patients to die of hemorrhage, so that according to Kaufmann,⁵ we may put the average at about 3 per cent.

¹ Ulcer of the Stomach, p. 199.

² Verhandlung. d. Gesellsch. f. Chirurg., 1897.

³ Congress of the American Physicians and Surgeons, Medical Record, 1897.

⁴ Deutsche Klinik, v, 508.

⁵ American Journal of the Medical Sciences, 1910, cxxxix, No. 6, p. 790.

According to Kaufmann, the severe anemia resulting from a profuse hemorrhage brings about changes in the system which, if undisturbed, of themselves tend to arrest the bleeding. The vasoconstriction which goes with sudden anemia and syncope allows the bleeding vessel to contract, and the decreased activity of the heart permits the formation of a thrombus. (Von den Velden¹ has lately demonstrated that after each hemorrhage the influx of serum from the tissues into the blood carries with it a great deal of thrombokinase, a substance which is present in all the tissues and which greatly increases the coagulability of the blood.) If, however, clotting does not spontaneously occur, or if the bleeding seems too profuse to warrant any delay, measures must be employed to artificially check the flow of blood. Operation has at times been resorted to for this purpose, but the existing conditions are, as a rule, unfavorable for successful surgical procedure.

Kaufmann, discussing the medical measures that have been employed to check grave hemorrhage from gastric ulcer, deplors the frequent use of stimulants, especially cardiac and vasomotor stimulants, as tending to defeat the attempts of nature to arrest the bleeding by thrombus formation. These patients seldom die from cardiac weakness and as decreased cardiac activity and loss of vasomotor tone are the most potent factors in permitting the formation of the thrombus, anything which would tend to counteract these conditions would be worse than useless in the attempt to save the patient's life. It is decidedly more rational to employ just the opposite measures and cause, if possible, a more rapid loss of cardiac and vasomotor tone. This can be accomplished by venesection. Especially if this procedure is carried out rapidly and while the patient is in a sitting posture, syncope can be produced which will frequently have the desired effect upon the circulation. Kaufmann recites that he has seen Kussmaul employ this measure in a case of extreme hemoptysis with excellent result and the same measure has been employed in cases of severe gastric hemorrhage. The same principle can be applied in a less heroic method by applying elastic ligatures to the four extremities.

Of medicinal measures that have been employed, Kaufmann mentions the *styptics* which were formerly much in vogue--acetate of lead, perchloride of iron, oil of turpentine, etc. He does not recommend their use as their action is unreliable, and they are furthermore apt to increase the ever present and annoying nausea, and often excite vomiting. He has the same opinion concerning *ergot* given by mouth, and he has never seen any benefit derived from the ergot preparations given hypodermically. *Calcium chloride* in full doses may prove of value in cases in which the bleeding is continuous but slight in amount, but it is slow in its action and can hardly be relied upon to exert any

¹ Archiv f. exp. Path. u. Pharm., 1909, lxi, 37.

influence in profuse bleeding. *Adrenalin* has the great disadvantage that the vasoconstriction produced by it is followed by a period of vasodilatation which may cause a renewal of the hemorrhage. As for the results derived from *gelatin* preparations given *per os* or *per clysm*, Kaufmann believes that the reports thus far published are not conclusive enough to warrant their use. He looks upon the employment of *serum* which has recently been introduced for the treatment of hemophilia as holding some promise of being a valuable remedy in the treatment of severe hemorrhage. *Escalin*, which is highly praised by Klemperer, he has seen used in but one case, which was of so unusual a type as to permit of no judgment of the value of the drug.

In Kaufmann's opinion the most reliable of the internal remedies in the treatment of excessive hemorrhage from gastric ulcer is *bismuth*. The crystalline bismuth subnitrate is preferable because, as Matthes¹ has shown, this salt sticks to the surface of the ulcer, accumulates there, and thus makes a protective coating for the ulcer. In this connection, a case reported by Naunyn² is of unusual interest. This case was one in which lavage of the stomach followed by the administration of bismuth stopped a profuse hemorrhage from a gastric ulcer. The patient, who at the same time suffered from excessive diarrhea, died from exhaustion and severe anemia. She had received 20 grams of bismuth subnitrate thirty-six hours before death, and twenty-four hours later an additional 5 grams. Autopsy showed that the ulcer was filled by a clump of bismuth about 20 grams in weight, while the remainder of the stomach contained but a very small quantity.

Of much more value than any of these measures Kaufmann considers to be *gastric lavage*. Since he first saw it performed in cases of bleeding ulcer in Kussmaul's clinic more than twenty-five years ago, Kaufmann has employed this treatment in a series of cases of profuse hemorrhage, in almost every case with favorable result. He realizes the aversion which most physicians harbor against this procedure and discusses the objections which have been raised against the treatment, as well as the advantages which he finds in it.

The most frequent objection raised against lavage is that it may cause perforation. Kaufmann claims that the danger of the tube penetrating the wall of the stomach is extremely remote and that the danger of causing perforation by overdistending the stomach with the fluid introduced is negligible in a properly administered lavage. "On the contrary," he says, "lavage exerts its greatest benefit by doing away with the real cause of overdistention, by removing the large quantities of accumulated blood, acid secretions, food remnants, and gas, which are usually present in such cases, often producing an enormous distention of the stomach." He says, moreover, that if it should happen

¹ Centralbl. f. innere Med., 1894.

² Deutsche med. Wochenschrift, 1898, Vereinsbeilage, No. 3.

accidentally that lavage is undertaken just before the threatening perforation actually occurs, the cleansing of the stomach will prove beneficial in preventing the escape of stomach contents through the perforation into the peritoneal cavity, thereby greatly improving the chances of operative success. He quotes a case of his own in which these incidents actually happened and attributes the success of the operation in part, at least, to the lavage.

A further objection to lavage is that it disturbs the complete rest of the stomach which is essential to firmly secure the freshly formed thrombus. This objection, according to Kaufmann, is valid when the hemorrhage has ceased, and it may be assumed that an efficient thrombus has been established. However, conditions are altogether different when the bleeding continues, because then either no thrombus has developed or it does not completely fill the opening in the vessel. It is known from general surgical experience that a partially occluding thrombus is often the cause of continued bleeding. The removal of such an inefficient thrombus is not only not dangerous, but on the contrary, is an actual necessity in order to give the bleeding vessel a chance to contract or to form a more efficient thrombus. Kaufmann believes that this hypothesis holds good for gastric hemorrhage, for in several instances he has observed that bleeding suddenly ceased during the performance of lavage.

Another objection to lavage during gastric hemorrhage is that the introduction of the tube is difficult and exciting for the patient. Kaufmann holds that when the lavage is performed by an experienced physician this objection is invalid and he himself has usually been able to insert the tube even with the patient lying on his back without causing excitement or great exertion. It is advisable to insert the tube just far enough to secure siphonage and to limit the quantity of water used each time to about 300 c.c.

Among the advantages of lavage, Kaufmann mentions the release of partially occluding thrombi which has already been discussed. According to him another striking advantage is the benefit derived when the stomach is distended by large quantities of contents. These stagnating masses are usually very sour and fermenting, and their presence not only causes nausea and pain, but acts harmfully by constantly irritating the mucous membrane to intense hypersecretion, thereby further increasing the amount of gastric contents. Moreover, the fermentation associated with such a condition invariably leads to pronounced and sometimes enormous gas distention of the stomach. Naturally, such a distention would be detrimental in every respect and it is without doubt frequently the direct cause of the continuation of the bleeding by preventing contraction of the stomach. According to Kaufmann, the evacuation of the stomach and the contraction which follows it are, moreover, of the greatest importance in improving the

circulatory disturbances which frequently associated themselves with the condition under discussion. He states that he has seen cases in which the pronounced symptoms of cardiac insufficiency were due more to the pressure of the gas-distended stomach against the diaphragm and heart than to the anemia. In these cases the circulation improved as soon as the stomach was emptied. In one case a pulse which had been 160 was reduced to 116 by the lavage.

Medical versus Surgical Treatment in Gastric Ulcer. The question of when to employ medicinal measures and when to resort to operation in cases of gastric ulcer is an important and frequently a difficult one for the physician to decide. Craig¹ has formulated for his own guidance the following rules which I believe are both sane and conservative:

"1. Cases of acute ulcer of the stomach may be confidently expected to get well with a course of sufficient rest combined with suitable dietetic and medicinal treatment. Should perforation occur, however, as it sometimes does even during a course of the above-mentioned treatment, then it is almost needless to say that surgical assistance is imperatively called for. On the other hand, should hemorrhage—even several successive hemorrhages—occur, I am not prepared to advocate operative interference in these acute cases. This is, I think, the only point upon which I am unable to agree with Mr. Taylor, who considers that where a copious hemorrhage has taken place, and more particularly where there is an immediate recurrence of it, an attempt should be made to secure the bleeding vessel in the floor of the ulcer. His reason, however, that a life may be lost which an operation would have saved, is worthy of careful consideration.

"2. In all cases of chronic gastric ulcer of a non-malignant type, unless it is apparent at the time that pyloric obstruction has been already produced by the ulcer, I consider it is only fair to give the patient a chance of recovery, in the first instance by a course of treatment similar to that employed in acute cases. I am bound to admit that, in the great majority of cases where the symptoms have been in evidence for a year or longer, recurrence of such symptoms takes place within a longer or shorter period, as the case may be, even although a cure appeared to have been effected as the result of the rest combined with dietetic and medicinal treatment. I am convinced, however, that a small proportion of these cases remain permanently well, and for this reason I believe the physician is justified in attempting the cure.

"It is in the chronic cases, where symptoms recur, that surgical interference has been followed by the most brilliant results, and it is in such cases that I gladly recognize the good effects that follow the operation of gastro-enterostomy when performed by a skilful surgeon;

¹ British Medical Journal, 1910, No. 2561, p. 247.

but it must be admitted that even when we exclude such occasional accidents as the occurrence of the vicious circle or perforation from an intestinal ulcer which has formed at a point opposite the opening of the stomach, there is still a margin of cases, whose number is at present unknown, in which all the previous symptoms reappear after operation. Nevertheless, there should be no hesitation in recommending a gastro-enterostomy to be performed in all chronic cases in which there is an undoubted recurrence of symptoms pointing to a chronic ulcer."

Choice of Operation in Gastric Ulcer. Another extremely important question which the physician should be as well prepared to solve as the surgeon is the operation to be performed in cases of gastric ulcer when surgery is resorted to. The operations which are performed are *gastro-enterostomy*, *excision*, and *resection* of that portion of the stomach in which the ulcer is located. *Gastro-enterostomy* has for some years been the operation which has the greatest number of supporters. The attitude of surgeons toward this operation was somewhat altered by the investigations of Clairmont, who demonstrated on the basis of extensive statistics that the advantages derived from this operation depend to an extent upon the location of the ulcer. He found that whereas 62 per cent. of the cases in which the ulcer is located in the pyloric region are materially benefited by gastro-enterostomy, the same operation helps but 47 per cent. of those cases in which the ulcer is situated in other portions of the stomach.

One of the most ardent supporters of *resection*, especially when the ulcer is located in other portions of the stomach than the pylorus, is Payr.¹ In one of a number of articles he has published on this subject he details his reasons for preferring resection to gastro-enterostomy, as follows:

He has frequently seen gastro-enterostomy fail to cure patients with gastric ulcer. He admits that the patients are not infrequently helped, but they often get mild attacks periodically after the operation. He has, moreover, been able to substantiate the above observation at operation. In one case he was able to observe at operation that a perfectly functioning gastro-enterostomy had had no influence on the ulcer. The second operation was performed two and one-half months after the gastro-enterostomy, and the ulcer was no smaller and showed no indications of a tendency toward healing. In another case excision, in addition to gastro-enterostomy, failed to cure the patient, whereas a subsequent resection of more than half of the stomach which was the seat of recurrent ulcers resulted in a complete cure. Payr mentions as of great significance in this connection that the Mayo brothers, who had previously discarded operative procedure in cases

¹ Wiener klinische Wochenschrift, 1910, No. 9, p. 310.

of ulcer on the lesser curvature on account of their unsatisfactory experience with gastro-enterostomy in these cases now practise resection and that they advise excision even when gastro-enterostomy is performed.

Payr contends that *excision* is not a more dangerous operation than gastro-enterostomy, and that in the past the dangers from it have been greatly overestimated. He thinks this overestimation is dependent upon the mortality resulting from resection in cases of carcinoma, where the conditions are so different that it is impossible to make comparisons. Payr himself has had a mortality from resection of but 5 per cent. and has calculated the mortality in 222 cases of various operators to be 12 per cent.

The most important reasons for preferring resection to excision or gastro-enterostomy Payr finds in the results of his studies of the specimens removed from the cases in which he has performed resection. He has found not only extensive fibrosis and scar tissue in the areas surrounding the ulcer for a greater or less distance, but also severe and far-reaching vascular changes, thrombosis, endarteritis, and endophlebitis. Especially in the medium-sized and larger arteries he has found these changes extending far without the margins of the ulcer, at times involving an entire segment of the stomach. Of much more importance than these changes, however, are his findings in regard to beginning carcinoma. In more than 25 per cent. of his cases he finds either beginning or moderately advanced carcinoma formation. In the vast majority of these cases, macroscopic examination of either the ulcer itself or the neighboring lymph glands failed to reveal any indications of this beginning malignant change. As Payr remarks, this constitutes almost the first reliable statistical information that has been obtained in regard to the frequency with which carcinoma develops from ulcer. Most clinicians believe that a certain number of cases of ulcer lead to carcinoma and the estimations of the frequency with which this occurs have varied from 10 to 80 per cent.; but such estimations have not, of course, the substantial histological basis that Payr's statistics possess. Much more extensive statistics will, however, be required for a final solution of the question. Ssapeshko, among others, claims that patients on whom gastro-enterostomy has been performed on account of ulcer by no means infrequently eventually die of gastric carcinoma, while Bamberger, on the basis of a large series of cases, claims that the mortality from carcinoma in patients who have had a gastro-enterostomy is very small.

Payr finds a further argument in favor of resection in the results of the recent investigations in gastric physiology. He refers especially to the layer-like arrangement of the food in the stomach and the gradual digestion and expulsion of the peripheral layers of this through the pylorus into the duodenum as was previously described in PROGRESSIVE

MEDICINE (December, 1908). He believes that this mechanism will usually cause the greater part of the gastric contents to pass through the pylorus in spite of the presence of the artificial opening between stomach and intestines. Of course, this does not apply to those cases in which there is either spastic or organic stricture of the pylorus; in such cases, the muscular activity of the stomach wall will undoubtedly force the contents through the gastro-enterostomy opening. As a result of both clinical and skiagraphic observations there is the greatest difference of opinion as to the route the stomach contents take in patients on whom gastro-enterostomy has been performed; some claim that it passes through the gastro-enterostomy opening; others claim that, in spite of the existence of the latter, the gastric contents take their normal course through the pylorus. It is very possible that either of these courses may be taken depending upon the condition of the pylorus, whether it be entirely passable or impassable as a result of either spastic or organic stricture.

Hochenegg¹ undertakes the defense of gastro-enterostomy as the most serviceable operation in gastric ulcer in all cases in which there is no macroscopic evidence for the suspicion of the existence of malignant change. He contends that even when the pylorus is entirely patulous the anastomosis between stomach and intestine functionates, and that it is of direct benefit in almost all cases of gastric ulcer regardless of its location. That the gastro-enterostomy opening is occasionally found to be closed or much narrowed some years after the operation he thinks is purely a result of the decrease in size of the previously overdistended stomach, or the formation of a valve at the point of anastomosis, or possibly the prolapse of a portion of the mucous membrane or the contraction of scar tissue. He believes that ulcers lying outside of the pyloric region are quite as well cured by gastro-enterostomy as are those located at the pylorus, but that it takes quite some time longer for the benefits of the operation to be evident in the case of the former than in that of the latter.

Hochenegg claims that Payr's statements in regard to the relative dangers from gastro-enterostomy and resection are misleading. The fact that Payr has had a mortality of but 5 per cent. indicates, according to Hochenegg, that the former is an excellent technician, but he believes that an adoption of this operation by surgeons in general will be attended by a much greater mortality. Hochenegg claims to have had excellent results with the performance of gastro-enterostomy in gastric ulcer regardless of the location, and mentions five cases from his private practice in which a gastro-enterostomy was performed on account of ulcer located outside of the pyloric region. All five patients have been well and entirely free from gastric symptoms for years.

¹ Wiener klinische Wochenschrift, 1910, No. 2, p. 52.

Finally, Hochenegg claims, as a point of great importance in favor of gastro-enterostomy, the fact that the latter guards against the recurrence of an ulcer, whereas resection in no wise protects the patient against recurrence.

The question is a difficult one to decide at present and its rational solution must in all probability await the collection of more extensive statistics of the results of the two operations. There is no doubt that gastro-enterostomy fails to cure in a certain percentage of cases, and this is true especially of ulcer located in other portions of the stomach than the pyloric region. Resection of the ulcer is undoubtedly a more satisfactory procedure than gastro-enterostomy from the standpoint of the existing ulcer alone, granting that the operative mortality of the two procedures be the same. However, there seems to be, at least theoretically, some merit in the claim that gastro-enterostomy protects against recurrence of the ulcer more than do other operative procedures. As was mentioned above, the gastric juice may be instrumental in the production of gastric ulcer, and a highly acid gastric juice seems undoubtedly to act in preventing the healing of the ulcer. If this is true, gastro-enterostomy probably exerts a beneficial influence upon recurrences by furnishing a constant drainage for the gastric juice. This reasoning would, of course, be invalidated by proof that the gastric contents did not escape by way of the gastro-enterostomy opening, as is claimed on the basis of skiagraphic investigations. In this connection an observation by Willcox¹ is instructive. He examined the gastric acidity of 5 patients before and after the performance of gastro-enterostomy for gastric ulcer. In 3 cases he found free hydrochloric acid to be absent after the operation, although it had been present before, and in all 5 cases the total acidity was less after the operation than before.

A most important argument in favor of resection is the statement of Payr that in over 25 per cent. of his resected ulcers he found beginning malignant change, though from macroscopic examination there were no indications of malignancy. If further observations bear out Payr's findings, resection must undoubtedly be preferred in the majority of cases, and if it be further proved that gastro-enterostomy exerts a favorable influence on the tendency to recurrence, this operation can be performed in conjunction with the resection if the operative mortality of the two procedures is not too great. It can be seen that the whole question is surrounded by so many hypotheses that its solution must await the collection of further statistics. In the meantime, clinicians and surgeons must obey their personal inclinations in advising one or the other of these operations.

A recent report from the Mayo clinic, by Wilson and MacCarty,²

¹ Quarterly Journal of Medicine, October, 1909.

² American Journal of the Medical Sciences, 1909, No. 453, p. 846.

on the relationship of gastric ulcer to carcinoma tends to confirm Payr's opinion of the frequency of gastric ulcer as a cause of carcinoma. Wilson and MacCarty made an exhaustive histological study of the specimens of gastric resections and excisions. The most important result of their studies is that in 109 out of 153 cases of undoubted carcinoma they found sufficient gross and microscopic evidence of previous ulcer to warrant the deduction that the carcinoma developed from ulcer; in other words, 71 per cent. of their carcinoma cases were secondary to gastric ulcer.

PERFORATING GASTRIC ULCER. Several articles on perforating gastric ulcer have appeared from the surgical clinics abroad, and the subject is one of such importance to the physician that the medical aspects of the condition will be briefly discussed here.

The most important articles have been those by Martens,¹ Mühsam,² Heinemann,³ and Morton.⁴

The frequency of perforating gastric ulcer has been variously estimated. According to Leube, perforation occurs in about 1 per cent. of all ulcerous affections of the stomach. On the other hand, according to Heinemann,⁵ the English place the frequency as high as 18 per cent. The female sex seems to be more frequently affected during the second and third decades than the male sex; the latter, however, seems to be more frequently affected after the thirtieth year. A remarkable circumstance for which there is no apparent explanation is that, according to the statistics of Brunner, gastric perforation is much more frequent in England than in any other country; for example, his statistics show it to be about ten times as frequent in England as in Germany.

The literature does not contain sufficient statistics to permit any reliable deduction as to which type of ulcer, the acute or chronic, the callous or carcinomatous, most frequently perforates. According to Heinemann, perforation occurs most frequently in those ulcers in which there are manifestations of a tendency to healing and the perforation usually occurs in the poorly nourished centre of the ulcer in which there are constantly recurrences of scar-tissue formation and ulceration.

Additional features of the pathology of perforating gastric ulcer are that it is usually single though occasionally multiple; that it is located on the anterior wall of the stomach in the neighborhood of the cardia more frequently than in the neighborhood of the pylorus, usually on the lesser curvature, occasionally on the greater curvature, and least frequently on the posterior wall. The size of the perforation varies

¹ Berl. klin. Woch., 1910, No. 10, p. 421.

² Deutsch. med. Wochenschrift, 1910, No. 23, p. 169.

³ Ibid., No. 25, p. 1186.

⁴ British Medical Journal, 1910, No. 2561, p. 249.

⁵ Deutsch. med. Woch., 1910, No. 25, p. 1186.

from that of a pinpoint to that of a five-cent piece, more frequently approximating the latter size than the former.

A peculiarity of the peritonitis which attends most of the cases of perforated gastric ulcer is the character of its extension. If the stomach is not so filled as to overwhelm the entire peritoneal cavity and the perforation occurs in its most frequent site, the anterior wall near the lesser curvature, the escaping fluid and the peritonitis which it induces usually follow the colon to the right hypochondrium (sometimes the left) then down the colon to the iliac fossa and finally into the pelvis. If, on the other hand, the perforation is in the neighborhood of the greater curvature, and especially if the stomach be well filled, the middle portion of the peritoneal cavity, that occupied by the small intestines, is usually especially involved. Finally, if the perforation is on the posterior wall, there is usually an inflammatory closure of the foramen of Winslow and a localized peritonitis in the lesser omental cavity results.

On account of the character of the extension of the escaping fluid and the consequent peritonitis, the appendix in these cases not infrequently becomes covered with a serous, or seropurulent exudate and the surgeon in operating, if the appendiceal region be first examined, may conclude that this is the seat of the trouble. Martens calls special attention to this, especially on account of the fact that not infrequently perforating gastric ulcer is wrongly diagnosed as appendicitis. In this connection a case reported by Moore¹ as one of simultaneous suppurative appendicitis and perforated gastric ulcer is interesting, especially as the perforation was in the anterior wall of the stomach toward the cardiac end and near the lesser curvature. The diagnosis before operation lay between appendicitis and perforated gastric ulcer. All that physical examination revealed was a thickening in the appendix region. It was decided to explore the appendix first. Fortunately the operator did not stop with this but went farther and found the gastric perforation.

Bacteriological examination of the peritoneal exudate attending perforation of gastric ulcer has revealed various organisms; most commonly streptococci and bacterium coli, but also staphylococci, yeasts, and anaërobic bacilli.

The *recognition* of perforation in cases of gastric ulcer is a matter of extreme importance, and one in which the physician must be at least fully as well versed as the surgeon, for it is usually the physician who first sees these cases and from the prognostic standpoint early recognition of the condition is of the utmost importance. In the diagnosis of perforation of a gastric ulcer the knowledge of the fact that a gastric ulcer has existed would be of the greatest importance. If the patient

¹ Lancet, 1910, No. 4506, p. 103.

has been known to have been under treatment for gastric ulcer the diagnosis of the perforation becomes much simplified. This, however, is seldom the case, and we must seek for characteristic symptoms in the history. According to Brunner (quoted by Heinemann) characteristic symptoms of gastric ulcer can be determined in 90 per cent. of the cases of perforation.

According to Martens, the *suddenness of the onset* of symptoms is one of the most characteristic and one of the most reliable features of perforation. The majority of patients are suddenly affected while at work, or at meals, or even while asleep. Occasionally symptoms have their onset coincident with great bodily strain.

The first and most important symptom noted by the patient is *frightful abdominal pain*, such as, according to Brunner, occurs in scarcely any other condition. Most patients experience the sensation as if something were suddenly torn in their abdomen and not infrequently go into collapse as a result of the severity of the pain. The location of this pain is usually in the upper abdomen corresponding to the site of the perforation, but occasionally extends throughout the entire abdomen.

The appearance of the patient shortly after the perforation is usually characterized by the typical abdominal facies, drawn nose, superficial costal breathing with an extremely anxious appearance of the face, from fear that every movement will increase the pain. For a certain small percentage of cases, however, this does not apply, for occasionally we find a patient who, the original severity of the pain having somewhat subsided, lies calmly and quietly as though nothing had happened.

The *absence of vomiting* in the presence of the other symptoms is supposed to be rather characteristic of gastric perforation. Heinemann cannot see sufficient basis for this supposition. If the perforation were large enough to permit the escape of a large portion of the gastric contents into the peritoneal cavity he could see some reason why the patient should not vomit. In his cases there was *repeated vomiting*. However, in the cases reported by both Mühsam and Morton vomiting was not a prominent feature. In 6 of the 11 cases reported by Morton there was no vomiting; in the 12 cases reported by Mühsam, but 2 had protracted vomiting; 2 others vomited only once, the remainder having not vomited at all. According to Brunner, vomiting occurs in about one-third the cases.

The *temperature* in the reported cases has varied so greatly that nothing characteristic can be seen in it. Some patients are in a state of collapse with a decidedly subnormal temperature; others have temperature as high as 102° or 103° F. The pulse is usually small and rapid, but an extremely slow pulse may be observed. In Morton's cases the pulse varied in rate from 64 to 148.

The *leukocyte count* frequently gives valuable information. In one

of Martens' patients, a young man, 23,600 leukocytes were found two and one-half hours after the perforation, and in another case 30,000 four hours after perforation. In 9 of the 12 cases reported by Mühsam, the leukocytes varied between 12,000 and 30,000. Naturally the leukocyte count will depend upon the severity of the attending peritonitis and the patient's resistance. Thus, in an elderly man with a subnormal temperature and an extremely rapid pulse, forty hours after perforation the leukocyte count was 3400. Taken in conjunction with the other findings, the leukocyte count cannot fail to be of service.

The *Arneth picture of the nuclear leukocytes* may also be of service in establishing a diagnosis or making a prognosis. It was studied in 3 of Mühsam's cases. In 1 patient who recovered there were 8000 leukocytes, 20 per cent. of which were polymorphonuclear leukocytes with but a single segment; in another patient who recovered there were 17,000 leukocytes, 18 per cent. of which were polymorphonuclear leukocytes with but one segment. In another patient, the one segment leukocytes were 32 per cent., later 45 per cent., and finally 50 per cent.; the latter figure was found as the patient developed a subphrenic abscess shortly before death.

The examination of the abdomen is extremely important. In almost all cases there is found an extreme *rigidity of the abdominal wall* and the tension of the abdominal muscles frequently causes retraction rather than distention shortly after the perforation, though later the increasing meteorism will cause various degrees of distention. Heinemann found in one of his cases that, although the entire abdomen was distended, the distention in the stomach region was visibly more marked than throughout the remainder of the abdomen. Palpation reveals the extreme rigidity of the abdominal wall which is usually more marked in the upper than in the lower portion, and usually somewhat more marked on one side than on the other, corresponding to the location of the perforation. If the perforation is in the neighborhood of the pylorus, the right rectus is usually more firmly contracted than the left; if the perforation is in the neighborhood of the fundus or the cardia, the reverse obtains. Tenderness is usually marked throughout the entire abdomen, but frequently more so in the neighborhood of the perforation.

Percussion may or may not reveal reliable data. In some cases extreme *tympany* over the area of the stomach suggests the presence in that region of gas in the peritoneal cavity. The disappearance of liver dullness has been considered an extremely important sign; however, extreme meteorism can so simulate the presence of gas free in the peritoneal cavity that too much weight must not be placed on this sign. The movability of the gas in the peritoneal cavity has been looked upon as a sign of great importance but its determination imposes so much danger of spreading the peritonitis that Martens looks upon

its determination as unjustified. The same holds true of the determination of movable areas of dulness. In this connection it must not be forgotten that dulness in the right ileocecal region may be present, as described above, and give rise to the suspicion of the existence of an appendiceal abscess.

Auscultation is supposed to reveal friction sounds and splashing or gurgling in the epigastric region, but these signs are of doubtful significance.

The *differential diagnosis of perforated gastric ulcer* from other conditions resembling it may be extremely difficult. However, the suddenness of onset and the severity of the initial pain, with other symptoms that may be present, will usually lead to a correct diagnosis. Perforative appendicitis, with which perforated gastric ulcer is most frequently confounded, usually does not have such a sudden, violent onset and the history is usually more indicative of appendiceal than of gastric disease. Similarly, inflammatory conditions of the pancreas or bile passages are usually not so sudden or so violent in their onset, although I have had occasion to observe how difficult the differential diagnosis may be between perforated gastric ulcer and an acute hemorrhagic pancreatitis. However, in pancreatitis the pain is usually not so great as in perforated ulcer; the slow pulse frequently noted in pancreatitis and the absence of marked abdominal rigidity, local tenderness, and subsequent distention will usually aid in the diagnosis. Perforation of the gall-bladder may greatly resemble perforated gastric ulcer, but the history will usually lead to a correct diagnosis. If the confusion in diagnosis lies between perforated gastric ulcer and peritonitis resulting from other causes, little harm can be done, for the treatment in both cases must be the same.

Treatment. The only efficient treatment for perforated gastric ulcer is now universally recognized to be surgical; however, there exists some difference of opinion as to when operation should be undertaken, some observers advising delay until the patient is out of the initial shock, others advising immediate operation. It is the opinion of both Martens and Heinemann that energetic stimulation between the time when the patient is first seen and when operation is commenced will sufficiently overcome the shock to permit operation to be undertaken. Furthermore, it has been shown that the prognosis is directly dependent upon the time intervening between perforation and operation. Brunner has estimated that the best results are obtained when the patient is operated upon between five and ten hours after perforation. Between these hours he found the mortality to be but 20 per cent. If more time elapses, the prognosis becomes distinctly more unfavorable. The importance of early operation is apparently so great that Martens advises warning all ulcer patients of the possibility of perforation, advising them of what the symptoms are and what to do immediately upon

the occurrence of these. He relates the case of one patient who had been so instructed, and on the subsequent occurrence of the perforation the patient had himself taken immediately to the hospital where operation was commenced within an hour after the perforation and resulted in recovery.

Cancer of the Stomach. Remarkably little literature on cancer of the stomach has appeared during the past year. Most of the articles which have been published deal with special methods of diagnosis.

SALOMON TEST. Goodman¹ contributes an article on the Salomon test and its value. This subject was briefly discussed in conjunction with the Grafe-Röhmer hemolytic test in *PROGRESSIVE MEDICINE* for December, 1909. The test consists merely in the determination of the amount of nitrogen contained in a known quantity of water with which the stomach is washed out when it is free from all material introduced from without. The originator assumed that considerable serous fluid must be discharged from the ulcerating surface of a carcinoma into the stomach cavity and this would naturally cause a higher content of nitrogen in the gastric contents than would occur in a normal stomach or any other stomach disorder not associated with extensive ulceration.

The test is performed as follows: On the morning previous to the day the examination is to be conducted, the patient should receive only liquid food and the same is given in small quantities when necessary throughout the rest of the day to still the patient's hunger. In the evening the stomach is washed out until the water returns perfectly clear. After this neither food nor drink is given until the following morning, when the stomach is again washed out, this time exactly 400 c.c. of normal salt solution being used, and repeatedly introduced and withdrawn so that all fluids or substances which may have collected overnight in the stomach are withdrawn. The nitrogen content of this fluid is then determined by the Kjeldahl method and the result expressed in grams of nitrogen in 100 c.c. The albumin content may also be estimated, the Esbach method being used for this purpose. Salomon found the nitrogen content in non-carcinomatous cases to be between 0 and 16 mg. per 100 c.c. of fluid. The non-carcinomatous cases so studied included the following diseases: Nervous dyspepsia, chronic gastritis, gastropotosis, acute gastritis, gastrectasis, hyperacidity, and chronic gastric ulcer. In these cases the Esbach test for the estimation of the amount of albumin present showed only a slight opacity.

Salomon's study of 6 cases of carcinoma of the stomach, according to his method, revealed between 10 and 70 mg. to 100 c.c., and the albumin content was between $\frac{1}{16}$ and $\frac{1}{2}$ per mille. According to the originator, a case is extremely suspicious of carcinoma if the nitrogen content

¹ *Archiv für Verdauungskrankheiten*, 1909, Bd. xv, Hft. 4, p. 447.

exceeds 20 mg. per 100 c.c., or if the Esbach test gives a distinct precipitate.

Siegel¹ studied 20 cases of gastric disease, applying the Salomon test in all. In his cases of carcinoma the nitrogen content varied between 35 and 63 mg. He, however, obtained high figures for the nitrogen content in gastric ulcer as well as in cases of mild benign pyloric stenosis. He concluded that all cases showing nitrogen content of over 25 mg. should be looked upon as suspicious of gastric carcinoma.

Berent and Gutman² think that the method is of little value excepting in cases of ulcerated carcinoma and consequently look upon a positive finding as of much more significance than a negative result.

Reichenstein³ obtained an extremely small nitrogen content in a case of carcinoma which he studied, and concluded that the method is of little value. He believes that the high nitrogen content occasionally observed is dependent upon food remnants which are not removed by the stomach washing on the evening previous to the administration of the test.

Orlowski,⁴ on the other hand, expresses a favorable opinion of the test and believes that it will prove to be of great clinical importance.

Schittenhelm and Lowes⁵ found in no cases of chronic gastritis or gastric ulcer so high a nitrogen content as they did in carcinoma, and consequently look upon the test as of value in the diagnosis of gastric carcinoma.

Zirkelbach⁶ is convinced of the value of the test but places the minimum nitrogen content that is suggestive of carcinoma as 30 mg. instead of 20 mg. as does Salomon.

Witte,⁷ as the result of a study of 16 benign and 11 malignant cases of stomach disease, concluded that the test is of value in differentiating carcinoma from gastritis or ulcer; in gastrosuccorhea, however, his results were not characteristic of a benign disorder.

Schupfer⁸ is convinced that the test is of value if one recalls that occasionally a positive reaction occurs in non-carcinomatous cases. Romano⁹ and Yague¹⁰ are convinced, as a result of their studies, that the test is of absolutely no value.

Before studying his gastric cases, Goodman undertook the study of a number of normal individuals. In 2 out of 9 normal individuals studied, the nitrogen content was well above that which, according

¹ Berliner klinische Wochenschrift, 1904, pp. 299 and 338.

² Deutsche med. Wochenschrift, 1904, p. 110.

³ Zeitschrift für klinische Med., 1908, lxx, p. 33.

⁴ Ibid.

⁵ Zentralbl. f. Stoffwechsel. u. Verdauungskrank., 1905, xviii, p. 409.

⁶ Archiv für Verdauungskrankheiten, 1906, xii, p. 543.

⁷ Zeitschrift für klinische Med., 1908, lxx, p. 30.

⁸ Deutsche med. Wochenschrift, 1907, p. 154.

⁹ Ibid., p. 771.

¹⁰ Münchener med. Wochenschrift, 1907, p. 850.

to Salomon, indicates the presence of a gastric carcinoma. In 1 of these 2 cases 49 mg. per 100 c.c. of wash water was found, and in the other 21 mg. The test was applied to a number of patients suffering from other than gastric diseases; among these was a case of pernicious anemia in which 45 mg. of nitrogen were found. In a case of pulmonary tuberculosis 21 mg. were found and the same quantity was observed in a case of chronic interstitial nephritis.

Among the gastric disorders, exclusive of carcinoma, to which the test was applied were 9 cases of hyperchlorhydria, in 2 of which the nitrogen content was above the minimum limit given by Salomon as indicative of carcinoma. Of 3 cases of gastropotosis, 2 gave a positive test for carcinoma. Of 5 cases of chronic gastritis, 2 showed 21 mg. of nitrogen; 6 cases of chronic gastric ulcer were studied, 1 of which showed a nitrogen content of 31 mg.; 1 acute gastric ulcer was studied and gave a positive result for carcinoma, 38.5 mg. nitrogen being determined.

Eight cases of gastric carcinoma were investigated, in all of which the diagnosis was substantiated at operation. In 3 of the 8 cases a quantity of nitrogen less than 20 mg. per 100 c.c. of wash water was determined. However, as 1 of these cases had already been operated upon and the stomach resected it can hardly be included with the remaining cases.

Goodman proposes a modification of the Salomon test, which, according to his studies, reveals much more reliable results. As the disintegration of the cells composing the carcinoma releases a great deal of nuclear substance most of which is nucleoprotein, and as one of the end-products of nucleoprotein is phosphorus, Goodman concluded that an estimation of the amount of the latter in a given quantity of wash water would indicate the amount of cellular destruction that is going on, and thus serve as a reliable indication of the existence of gastric carcinoma. The result he expresses in the number of mg. of P_2O_5 per 100 c.c. of wash water. In none of the 48 non-carcinomatous cases studied did the amount of phosphorus, expressed as above indicated, exceed 10 mg. On the other hand, in 6 of the 9 cases of gastric carcinoma the amount was above 10 mg. As the result of his studies Goodman concludes that:

1. In normal individuals and in patients suffering from diseases exclusive of carcinoma of the stomach, the Salomon test occasionally gives more than 20 mg. of nitrogen per 100 c.c. of wash water.

2. Not all cases of gastric carcinoma reveal more than 20 mg. of nitrogen; the absence of ulceration is probably responsible for this.

3. The test is by no means pathognomonic and can be considered only as contributory to other symptoms.

4. The phosphoric acid content of the wash water of a non-carcinomatous case is less than 10 mg. per 100 c.c.

5. The phosphoric acid content of the wash water in cases of carcinoma of the stomach usually exceeds 10 mg.

Goodman will have performed a worthy service if the modification he proposes proves to have real diagnostic value. The fact that he obtained less than 10 mg. of P_2O_5 per 100 c.c. in all of his non-carcinomatous cases looks promising. However, it is to be hoped that the application of the test to a larger number of carcinoma cases will be attended with a positive result; that is, the determination of more than 10 mg. of P_2O_5 per 100 c.c. of wash water in a larger percentage of cases than occurred in the 9 studied by Goodman. The results he has obtained in both carcinomatous and non-carcinomatous cases indicate that his modification is somewhat more reliable than the original Salomon test. Goodman's results with the Salomon test in both non-carcinomatous and carcinomatous cases do not justify a great deal of reliance in the test and a number of cases recorded in literature, not specifically mentioned by Goodman, by no means tend to increase the reliance one would be inclined to place in it. Schittenhelm and Lowes, for instance, found 28.8 mg. of nitrogen in the case of a young girl with hyperacidity and 28.6 mg. in a case of gastro-succorhea, while Zirkelbach in 2 cases of gastric carcinoma found respectively 5.3 and 8.3 mg.

I am strongly in favor of maintaining an extremely critical attitude toward the significance of tests of this nature until frequent application has determined their value. They must be used, otherwise we never will determine their diagnostic significance and progress in diagnosis will cease. But until longer usage has determined their value little reliance should be placed upon them in determining a diagnosis. It is so easy, if we have a laboratory test of this nature, to rely so much upon the result of its application, that we are inclined to ignore the importance of a full and exhaustive history and a painstaking physical examination which will not infrequently reveal more of a definite nature than numerous laboratory examinations. In the subject at hand, I should be inclined to place much more significance upon the statement that the patient suspected of carcinoma had vomited remnants of food eaten a day or two before, or upon the determination of the facts that the patient, if past middle life, had always previously had a good appetite and only recently began to have gastric distress with occasional vomiting, at the same time noticing a distaste for food, especially meat, than I would upon a positive Salomon test. Moreover, the rationale of both the Salomon test and Goodman's modification makes them of doubtful value in the diagnosis of gastric carcinoma in a sufficiently early stage to permit of surgical cure. Both of them depend upon the presence of more or less extensive ulceration and many carcinomas, especially the scirrhus infiltrating carcinomas, are beyond the stage of operative cure by the time extensive ulceration has taken place.

On the other hand, ulceration usually takes place rather early in the soft medullary carcinomas. However, it must always be our aim to make the diagnosis as early as possible in all forms of gastric carcinoma, and I believe that with painstaking attention to the details of the history and to the search for manifestations of interference with gastric motility we will be enabled to do so more frequently than by relying upon most of the laboratory tests that have been proposed.

GRAFE-RÖHMER HEMOLYTIC TEST. The fate that is met by tests for which undue claims are made seems to have befallen the Grafe-Röhmer hemolytic test for carcinoma of the stomach. This test was briefly referred to in *PROGRESSIVE MEDICINE* for December, 1908, and December, 1909. The originators of the test, observing the severe secondary anemia which frequently attends gastric carcinoma and being aware of the hemolytic substances usually present in malignant tumors, concluded that similar substances should be demonstrable in the stomach contents of individuals suffering from gastric carcinoma.

The method employed by Grafe and Röhmer¹ is as follows:

The stomach is first well washed out, and the patient is then given an Ewald test breakfast. After three-quarters of an hour this is removed, 100 c.c. of normal salt solution, or distilled water being used to accomplish its thorough removal. Sodium bicarbonate is added to this fluid until it is slightly alkaline; 100 c.c. of ether are then added and the mixture shaken in an apparatus for twelve hours. The ether is then evaporated and the residue taken up with normal salt solution, 1 c.c. of the latter being used for each 10 c.c. of gastric contents originally removed. Quantities of this resulting solution ranging from 0.1 c.c. to 1 c.c. are then placed in appropriate tubes and to each is added 1 c.c. of a 5 per cent. solution of washed rabbit corpuscles. Finally, normal salt solution is added to each tube until the total quantity in each tube measures 3 c.c. The tubes are then placed in a thermostat at 37° C. for three hours, during which time they should be well shaken at least three or four times. They are then placed on ice overnight and are inspected for hemolysis the following morning. Only complete hemolysis is reported as a positive response to the test.

In Grafe and Röhmer's first communication they reported the following results:

In 20 normal individuals—a negative result in all.

In 24 individuals suffering with gastric ulcer—a negative result in all.

In 31 cases of various gastric disorders exclusive of carcinoma—negative result in all.

In 19 cases of positive gastric carcinoma—a positive result in all.

In 17 cases of clinically positive cases of gastric carcinoma—a positive result in all.

¹ Deutsch, Arch. f. klin. Med., 1908, Bds. xciii and xciv.

In 16 cases suspected of gastric carcinoma—a positive reaction in 14, a negative reaction in 2.

The results of Grafe and Röhmer's second series of cases were as follows:

In 21 cases of undoubted gastric carcinoma—a positive result in all.

In 24 cases of gastric ulcer—a positive result in 6 severe cases.

In 46 cases of various gastric disorders exclusive of ulcer and carcinoma—a positive result in only 9.

A negative result in all non-gastric cases in which the test was employed.

As a result of their investigations, Grafe and Röhmer concluded that their test was of great diagnostic value and that a positive result with very few exceptions, notably severe gastric ulcer, denoted the existence of a gastric carcinoma.

Frey and Lefmann¹ applied the hemolytic test to the stomach contents of two patients suffering from gastric carcinoma and obtained positive reactions. They then applied the test somewhat differently. They assumed that if the hemolytic substances are derived from the carcinoma they should appear in the stomach even when no test meal has been given. Proceeding from this assumption they washed out the empty stomach and used this wash water for the hemolytic test just as Grafe and Röhmer did with the fluid removed after a test breakfast. They applied the test to 17 individuals who were positively not suffering from gastric carcinoma and obtained a positive reaction in 14 of these cases. Subsequently Sisto and Jona² used the test in 30 cases of various types, including both carcinoma and other diseases of the stomach. As they claim to have observed hemolysis in all of the cases of carcinoma and not in any other diseases, they look upon the test as a reliable one.

During the past year two articles have appeared on the Grafe-Röhmer test in which the authors give the results of their observations which tend to the belief that there is no diagnostic significance in the test. The first of these is by Fabian,³ the other, an especially impressive article from Maragliani's clinic in Genoa, by Livierato.⁴

Fabian used the test in 28 cases. Of these, 12 were cases of gastric carcinoma, 7 of which reacted positively, and 5 negatively even though 3 of the latter were cases of extensive involvement with metastasis to the great omentum. Of 7 cases of gastric ulcer, 2 gave a positive reaction. Moreover, 1 case of lymphosarcoma of the stomach, and 1 of gastrectasis with adhesions gave positive reactions.

Livierato performed the test in a most exhaustive and painstaking manner, using in each case not only an ethereal extract of the stomach

¹ Med. Klinik, 1908, No. 46.

² La Clin. Med. Ital., 1909, Nos. 5 and 6.

³ Deutsche med. Wochenschrift, 1910, No. 12, p. 554.

⁴ Berliner klinische Wochenschrift, 1910, No. 31, p. 1452.

contents, but also an alcoholic extract and the plain filtrate. He applied the test in 23 cases of carcinoma of the stomach, 34 cases of gastro-intestinal disorder other than carcinoma, and 19 cases normal as far as the gastro-intestinal condition was concerned. In the cases of carcinoma he obtained a positive hemolytic reaction in 65 per cent.; in the cases of various gastro-intestinal disorders, exclusive of carcinoma, he obtained a positive reaction in 58 per cent., and in the normal cases in 48 per cent. He concludes that in the majority of individuals suffering with gastric carcinoma, hemolytic substances are found in the stomach contents, but since the same phenomenon is observed in almost the same frequency in normal individuals and in individuals suffering from gastro-intestinal diseases other than carcinoma the test loses all diagnostic value. It may be well to await further observations to decide definitely as to the significance of the test, but it appears at present as though an excess of enthusiasm had led the originators of the test to somewhat unsubstantial observations.

DIGESTION IN THE CARCINOMATOUS STOMACH. It has frequently been demonstrated¹ that digestion, especially the digestion of proteid, is carried to a farther point in the carcinomatous stomach than in the non-carcinomatous stomach. Müller expressed the belief that this is caused by the presence of ferments which are a specific product of the carcinoma. On the basis of this hypothesis, Neubauer and Fischer² undertook to determine whether such ferments were constantly present in the carcinomatous stomach and whether they are present in otherwise diseased or normal stomachs. For this purpose they employed glycyltryptophan, a tryptophanpeptide which with bromine water gives no reaction; tryptophan, however, which results from the splitting of the tryptophanpeptide by ferments, gives with bromine water a red-violet reaction. They first studied the direct action of the juice extracted from carcinomas on glycyltryptophan and found that this was capable of rapidly splitting it, showing that carcinomas are rich in proteid-splitting ferments. They found the same to be true of sarcomas but not of benign tumors.

Before proceeding to test the stomach contents of patients suffering with gastric carcinoma, they tested the action of normal gastric juice. For this purpose the gastric juice of both dogs and normal human beings was employed and found to be entirely incapable of splitting the glycyltryptophan. They then investigated four other factors that might act as sources of error in their investigations, these were: (1) The possible spontaneous occurrence of tryptophan in the stomach contents; (2) the presence of peptide-splitting bacteria; (3) the presence of trypsin; (4) the presence of blood.

¹ Emerson, *Deutsch. Arch. f. klin. med.*, 1902, Bd. lxxii, p. 415; Fischer, *Deutsch. Arch. f. klin. Med.*, 1908, Bd. xciii, p. 98.

² *Deutsch. Arch. f. klin. Med.*, 1909, Bd. xevii, Hft. 5 and 6. p. 499.

Regarding the presence of tryptophan in the stomach contents, all investigators are agreed that it does not occur in the normal stomach. (It is possible that long-continued digestion of proteid by gastric juice may proceed to the stage in which tryptophan would be demonstrable, but this requires such a long time that it does not enter as a factor into the question under consideration.)

The occurrence of tryptophan in diseased conditions of the stomach has been studied by a number of investigators. Erdmann and Winternitz¹ concluded from their studies that tryptophan never occurs in a normal stomach, that it seldom occurs in gastric ulcer, but that in conditions such as carcinoma in which there is a high degree of retention, tryptophan can frequently be demonstrated. Glaessner² came to the same conclusions. Volhard³ attempted to make use of the presence of tryptophan as an aid to the diagnosis of gastric carcinoma. He added Witte peptone to the gastric juice removed from the stomachs of the suspected individuals, and later examined it for the presence of tryptophan. He obtained marked reactions in several cases of gastric carcinoma, but had the same result in benign achylia. Neubauer and Fischer's studies led them to conclude that tryptophan occurs with the greatest rarity in the gastric contents excepting in cases in which there is a regurgitation of intestinal contents into the stomach.

To determine the question whether bacteria can split glycytryptophan, they tested it with numerous pure cultures. *Bacillus proteus*, *Bacillus typhosus*, and *Bacillus coli* split the glycytryptophan in several days, whereas yeasts, lactic acid bacilli, and some of the molds were able to split it in a day. However, after filtering the cultures or adding toluol, tryptophan first made its appearance after several days. In their investigations, Neubauer and Fischer consequently added toluol to the stomach contents before allowing it to act on the glycytryptophan.

Regarding the influence of blood or trypsin derived from the pancreatic juice on the presence of tryptophan, Neubauer and Fischer found that both of these substances were capable of splitting glycytryptophan with the consequent appearance of tryptophan. In their presence, therefore, the test is of no value. The presence of blood is determined by applying any one of the chemical tests for blood. Neubauer and Fischer used the guaiac test. They emphasize the importance of testing not only the filtrate but also the residue on the filter paper, as occasionally the coloring matter of the blood will not go through the filter but the ferments contained in the corpuscles will. As it is almost impossible to determine the presence of pancreatic juice when a peptide-splitting ferment is present, the investigators contented them-

¹ Münchener med. Wochenschrift, 1903, p. 983.

² Berliner klinische Wochenschrift, 1903, p. 599.

³ Münchener med. Wochenschrift, 1903, p. 2130.

selves with testing for bile and when this is present assuming pancreatic juice also to be present.

The test is performed as follows:

A test breakfast is administered, and the stomach contents removed in one-half to three-quarters of an hour. This fluid is tested for the presence of bile and blood. It is then filtered, and the filtrate tested for the presence of tryptophan. If all of these tests are negative, the test for the presence of the suspected ferment is instituted. To about 10 c.c. of the filtered gastric contents is added a little glycyltryptophan, the mixture covered with toluol and placed in the thermostat for twenty-four hours. At the end of this time 2 to 3 c.c. are removed by means of a pipette from under the layer of toluol and placed in a test-tube. To this is then added several drops of a 3 per cent. solution of acetic acid and then a little bromine vapor is allowed to flow from a bottle into the test-tube until the upper portion of the latter assumes a light-brown color. The test-tube is now shaken and if tryptophan is present the mixture will assume a rose-red color. If no color appears more bromine vapor is added and the mixture again shaken; this procedure is repeated until either a rose-red color appears or the mixture assumes a brownish tint indicative of a definite excess of bromine. The greatest caution must be exercised when the bromine vapor is first added against adding an excess, for this causes so rapid a disappearance of the rose-red color that it may escape detection by even the most experienced eye.

Neubauer and Fischer applied their method to a number of carcinomatous and non-carcinomatous cases, with the following results: Four normal cases reacted negatively; 10 cases of gastric ulcer reacted negatively; 12 other cases of gastric disorder exclusive of carcinoma reacted negatively. Of 6 cases of carcinoma of the stomach in which the diagnosis was substantiated at operation or autopsy, 5 reacted positively; in the 1 case giving a negative reaction, only the vomitus could be investigated. Of 13 cases of clinically definite carcinoma of which 11 involved the stomach and 2 the esophagus, 12 gave a positive reaction; in the 1 case giving a negative reaction, only the vomitus was subject to study. Of 10 cases suspected of being carcinoma of the stomach, 6 gave a positive reaction, 4 a negative reaction.

On the basis of these results Neubauer and Fischer believe that though additional observations are desirable, they are justified in concluding that their test is of distinct clinical significance in the early diagnosis of gastric carcinoma.

The authors add that glycyltryptophan can be procured from the firm of Kalle & Company, Biebrich a Rh., Germany, under the title "Fermentdiagnostikum." It is supplied in bottles each containing the proper amount of glycyltryptophan and toluol for one test. For the performance of the test the filtered gastric juice is added to the

bottle until it reaches an indicated height and the bottle is then ready to place in the thermostat.

Sarcoma of the Stomach. Lofaro¹ recently collected the reported cases of sarcoma of the stomach, amounting in all to 121. In these cases the age of the patients varied between three and seventy-eight years, though more cases occurred between the ages of forty and fifty than in any other like period. A consideration of the symptoms led Lofaro to the conclusion that they did not greatly differ from those of carcinoma of the stomach, excepting that symptoms of stenosis occurred less frequently in sarcoma than in carcinoma. Lofaro found but 8 cases in which there were symptoms of pyloric stenosis.

Four cases of gastric sarcoma are reported this year, 2 by Maschke,² and 2 by Glendening.³ In the first case reported by Maschke, the sarcoma was found at autopsy in a woman, aged seventy-seven years, who died of purulent meningitis. The patient had not complained of gastric symptoms during life. The second patient was a man, aged twenty-nine years, in whom the first symptom was the vomiting of blood, a phenomenon which thereafter repeated itself at frequent intervals. The diagnosis of gastric carcinoma was made, but at autopsy a sarcoma was discovered.

The first case reported by Glendening was that of a man, aged thirty-three years, in whom the first symptom was a large gastric hemorrhage. The second case was that of a man, aged fifty-eight years, who for six months previous to death complained of loss of appetite and gastric distress occurring about two hours after meals.

Achylia Gastrica. Stockton⁴ contributes an article based on his study of 132 cases of achylia gastrica. These cases all occurred in his private practice and bore a relation to other gastric diseases in the ratio of 1 to 20. He recognizes four types of achylia gastrica as follows:

1. Cases in which there is persistent absence of ferments and hydrochloric acid.

2. Cases in which there is a very low and steadily decreasing secretion of ferments and hydrochloric acid which finally disappear entirely and remain permanently absent.

3. Cases which behave like one or the other of the preceding two groups save that at long intervals there may occasionally be found traces of combined chlorides or peptone.

4. Cases in which all secretion is absent for a long period after which there is a slow and gradual return. This group does not include the more frequently seen cases in which there is a temporary absence of secretion, lasting for days or weeks, followed by normal secretion.

¹ Deutsch. Zeit. f. Chirurg., 1909, Bd. ci, p. 478.

² Berliner klinische Wochenschrift, 1910, No. 21, p. 963.

³ American Journal of the Medical Sciences, 1909, No. 449, p. 191.

⁴ Ibid., p. 157.

Stockton recognizes various causes of achylia gastrica. The achylia gastrica that so frequently accompanies pernicious anemia he looks upon as a true achylia and believes that it results from an atrophy of the glandular parenchyma of the stomach. Gastritis seems to be the etiological factor in some cases. Other cases appear to be secondary to general infections. There is finally a large group of cases in which the cause is absolutely undeterminable. Stockton thinks that we may determine something regarding the cause of this group of cases if we will study carefully enough those patients in whom there is a low and decreasing secretion instead of waiting until there is a complete disappearance of secretion.

Of the 132 cases studied, 62 were males, and 70 females.

The age varied from twenty-one to seventy-two years; only 5 cases were under thirty and only 1 over seventy. There were 29 cases between the ages of thirty and forty; 37 between forty and fifty; 28 between fifty and sixty; and 25 between sixty and seventy.

In his series of cases Stockton was not able to determine any influence exerted by occupation upon the occurrence of the disease.

About 25 per cent. of the patients in whom the previous history was carefully recorded complained of long-continued stomach trouble; about 14 per cent. of prolonged mental strain or worry; 14 per cent. had had influenza, and 20 per cent. typhoid fever. One patient stated that the stomach trouble commenced immediately after typhoid fever. Pneumonia was recorded in 10 per cent. of the cases; alcoholism was admitted in only one case.

Stockton believes that the history of typhoid fever in 20 per cent. of the cases is very significant. I think that the significance of this fact depends upon the prevalence of typhoid fever in the region from which the patients come. In a locality which has been the seat of an epidemic of typhoid fever I believe that very nearly 20 per cent. of the inhabitants will have had the infection.

Stockton records the following diseases or conditions to have accompanied the achylia: He believes that eye strain was present in at least 50 per cent. of the cases. Pernicious anemia was present in 23 cases; marked arteriosclerosis in 8 cases; catarrhal gastritis in 6; hysteria in 4; persistent headache in 5; advanced nephritis in 3; tobacco intoxication in 2; alcoholic intoxication in 1; morphine habit in 2.

Of 115 cases, the bowels were reported regular in 23, constipated in 52, loose in 31, and irregular in 39. It has been my experience that diarrhea is of more frequent occurrence in achylia gastrica than is indicated by Stockton's statistics. An undoubted factor in this diarrhea is the rapid emptying of the stomach in achylia, a condition to which Stockton calls attention and which he attributes to an excess of gastric motility. I believe that the cause of this rapid emptying of the stomach is to be sought in the pylorus rather than in the muscular

action of the stomach wall. As is well known from the work of Cannon and others, the acid gastric juice when it arrives in the duodenum causes the pylorus to close. When no acid is present to produce the pyloric reflex, the pylorus remains open more than it normally does and thus allows the passage of a greater amount of gastric contents from the stomach into the intestines than is normal in a given period of time. It is undoubtedly the ejection of a considerable amount of undigested contents from the stomach into the intestine that induces the diarrhea. In many cases a characteristic feature of this diarrhea is the fact that the movements occur almost immediately after the taking of food.

Stockton records the liver as having been diseased in 33 of his patients. In 23, it was large; in 6, small; there was induration in the region of the gall-bladder in 2, and tenderness in the region of the gall-bladder in 1.

The state of the urine was recorded in 80 of his cases. Albumin was found in 33, casts in 16, hyperacidity in 19, indican in large amount in 13; alkalinity in 3, a low specific gravity in 21. He mentions further that the total amount of urine was decreased in 29 and the urea decreased in 40.

Stockton notes that stomach symptoms are not uniformly complained of by patients suffering with achylia gastrica. The following gastric symptoms did occur: There was vomiting at irregular intervals in 29 cases; nausea was present in 10 cases, regurgitation in 11, sour regurgitation in 6, eructation in 24, pain in 19, soreness in 9, anorexia in 20, hyperorexia several times, vague gastric distress in 30 cases, and excessive salivation in 2.

Especially interesting are the facts that a trace of lactic acid was present in 44 cases, and that more than a normal amount of mucus was present in 62 cases.

Fleckseder¹ records three interesting cases of achylia gastrica in which large numbers of colon bacilli were found in the stomach. He thinks that the two factors necessary for the implantation and growth of colon bacilli in the stomach are an absence of hydrochloric acid and either temporary or permanent insufficiency of the pylorus.

He proposes the following classification for the various forms of achylia gastrica:

1. Nervous achylia gastrica.

- (a) Transitory form (nervous heterochylia).

- (b) Transition form with insufficiency of the pylorus as a result of gastrovagus paralysis.

2. Gastritis achylia gastrica either with or without atrophy of the mucous membrane.

¹ Wiener klinische Wochenschrift, 1910, No. 20, p. 730.

(a) Resulting from an excretory gastritis (acute infectious diseases, latent dyspeptic phthisis, nephritis, carcinoma of distant organs).

(b) Resulting from gastritis from chronic passive congestion.

(c) Resulting from an autochthonous gastritis (deficient mastication, deficient nourishment, alcoholism, sputum gastritis, gastric carcinoma).

(d) Resulting from an enterogenous gastritis due to mechanical or nervous pyloric insufficiency.

3. Achylia in severe anemias or diabetes mellitus.

Anacidity. Kelling,¹ in an article entitled "Statistical Observations on the Absence of Hydrochloric Acid in the Stomach," presents a mass of more or less disconnected observations and facts, some of which are worthy of noting. He considers as cases of anacidity those in which, after an Ewald test breakfast, there is no free hydrochloric acid and total hydrochloric acid does not exceed 20. Of 3147 patients, the majority of whom suffered from gastro-intestinal disorder, 521 or 16.5 per cent. showed anacidity. It was slightly more frequent in women than in men. Kelling thinks this remarkable in view of the fact that a number of cases of alcoholic gastritis must necessarily have been included among the cases of anacidity occurring in men.

One interesting observation of Kelling's was the average age of the patients suffering with anacidity as compared with the average age of a large number of patients in the same locality suffering with hyperacidity. It has been claimed that anacidity is usually preceded by a stage in which there is hyperacidity. If this be so, the average age of a large series of cases of hyperacidity must be lower than the average age of a large series of patients suffering with anacidity. Kelling found, however, that this was not the case. The average age of 125 men with an acidity between 85 and 150 was thirty-nine years. The average age of 60 women with similar acidity was thirty-eight years. The average age of 180 men with anacidity was thirty-seven years, and the average age of 120 women with anacidity also thirty-seven years.

His observations on the presence of hydrochloric acid in cases of gastric carcinoma are interesting. Of 622 cases, 462 showed anacidity and 160 more or less hydrochloric acid. Thus, 25.7 per cent. of his cases of gastric carcinoma responded to the test for hydrochloric acid. As Kelling says, if one depended upon anacidity for a diagnosis of gastric carcinoma he would wrongly diagnosticate one out of every four cases.

Kelling warns against the hasty diagnosis of carcinoma of the stomach on the basis of anacidity associated with the presence of small amounts of blood from the stomach, for he says the mucous membrane of the stomach in cases of chronic gastritis, which is frequently at the basis of the anacidity, is so easily wounded that it not infrequently bleeds upon slight provocation.

¹ Arch. f. Verdauungskrank., 1909, Band xv, Heft 5, p. 568.

Kelling found anacidity in 30 per cent. of 254 cases of cholelithiasis; and in 40 per cent. of 195 cases of pulmonary tuberculosis. He makes the rather startling statement that neither chronic passive congestion, moderate icterus, nor the regurgitation of bile and pancreatic juice into the stomach has any influence upon the secretion of hydrochloric acid. In regard to poisons, he was unable to determine any influence of either mercury or lead. (Anacidity is a rather frequent accompaniment of severe chronic lead poisoning.—L.) He makes the amusing statement that in America the eating of ice, especially of artificial ice, is supposed to induce gastric catarrh, and thinks this is easily understood when one realizes the length of time that the water, derived from the melting ice in the stomach, must remain in contact with the gastric mucosa. The American fondness for iced drinks has long excited the amazement of the continental people, but I believe that most Americans would be amused to learn that the eating of large amounts of ice is a national habit.

According to his statistics, Kelling gives the following factors as important in the production of anacidity:

1. Infectious diseases, the toxins of which, circulating in the blood, apparently have a harmful effect upon the stomach mucous membrane.

2. Carcinoma, even when located in other organs than the stomach, apparently produces toxins which harm the secreting glands.

3. Diseases of metabolism, principal among which is the uric acid diathesis.

4. The diathesis which is responsible for cholelithiasis.

5. Tapeworm appears to be able to produce anacidity in many individuals.

6. The most important of all factors in the production of anacidity is what might be termed the nervous element, although he is not able to determine in what manner this element acts, for, as before noted, he finds the average age for anacidity to be practically the same as that for hyperacidity, which is also in the majority of cases supposed to be dependent upon nervous influences.

Functional Gastric Diseases. **DYSPEPSIA.** More than fifty years ago Brinton wrote as follows:

“As the progress of scientific medicine has gradually revealed the morbid anatomy of the digestive canal, and thus detected structural disease with increasing accuracy and frequency, the vague (but useful) term ‘dyspepsia’ has acquired a continually more restricted meaning. Nor can we doubt that it is destined to still further limitation, and that, as advancing knowledge brings us better means of investigation, and so enables us to discover and distinguish structural changes of which we now can only observe the functional results, the aggregate of maladies called dyspepsia must undergo successive subtractions, tending

more or less completely to its total subdivision into special maladies, and to the removal of this term from our nosology."

"APPENDIX DYSPEPSIA." There is no doubt that time is justifying Brinton's prophetic words, and during the last year especially have three contributions appeared which foretell a rapid reduction in the number of the dyspepsias and the gastric neuroses. These are an article entitled "Appendix Dyspepsia," by Moynihan,¹ a second, entitled "The Clinical Significance of Gastric Hypersecretion and its Connection with Latent Disease of the Appendix," by Fenwick,² and a third, "Appendicular Gastralgia; or the Appendix as a Cause of Gastric Symptoms," by Paterson.³ An additional article of a similar nature is that entitled "Dyspepsia and Indigestion Viewed from a Surgical Standpoint," by Munro.⁴ These are by no means the first occasions upon which the appendix has been held responsible for gastric symptoms. A number of years ago Ewald used the term "Appendicitis larvata" and Senator the term "Atypische appendicitis" in describing gastric symptoms due to appendiceal disease and in the past, surgeons, especially in this country, have occasionally found only a diseased appendix to account for a train of gastric symptoms, but until the present no such comprehensive accusations have been made against the appendix as a cause of gastric disorder as is contained in the three contributions mentioned.

Moynihan's article called forth a mass of literature in the form of letters to the journals, some of them taking issue with him, others strongly commending his views. According to Moynihan, there are two types of dyspepsia for which a diseased appendix may be responsible. One of these strongly resembles gastric ulcer excepting that the symptoms, instead of being methodical as they usually are in gastric ulcer, are capricious. Excepting for this caprice, however, the symptoms resemble those of gastric ulcer in great detail, even to the presence of gastric hemorrhages. In the other group, the symptoms conform less to any definite picture of gastric disease; the complaints are of discomfort after food, of inability to eat generously, of flatulence, and of occasional colic with diarrhea.

Moynihan describes the condition of the appendix in cases of "appendix dyspepsia" as follows:

"The appendix, when examined before and after removal, may present almost any degree of abnormality. I have twice found it to be tuberculous, on several occasions to be filled with pus, and in every case to show indisputable evidence of ancient disease. The most frequent of all the changes found is this: for the first inch or rather less from its cecal attachment the tube is thin, pale, and narrow; adhe-

¹ British Medical Journal, 1910, No. 2561, p. 241.

² Lancet, 1910, No. 4515, p. 706.

³ Ibid., p. 708.

⁴ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 25, p. 843.

sions commonly bind it to the cecum or to the iliac fossa, or, rarely, to the abdominal wall. Beyond this first inch the appendix is enlarged, its walls greatly thickened, and its cavity, which is greatly dilated, contains one or more concretions, or a thick, offensive, and possibly purulent fluid. The distinction between the two portions of the appendix—the one thin, pale, and empty, the other turgid, grossly enlarged, and overfull—is striking. At the junction between them a strong, firm adhesion may be found. In other cases the appendix is club-shaped, with a narrower pedicle and a large free extremity. In all forms its lumen is obstructed either by a definite constriction or by external attachments. Upon section, the walls show the evidences of old inflammation, and the submucosa especially seems to bear the traces of this attack.”

Moynihan summarizes his conclusions as follows:

1. The symptoms of both gastric and duodenal ulcer, especially the former, may be exhibited with great fidelity in cases where no structural lesion can be found in these parts.

2. In many cases of “gastric ulcer” in which the symptoms of pain, vomiting, and hematemesis are present, and in many cases of intractable dyspepsia of a capricious kind, the only pathological change discovered during operation is a chronic inflammation of the appendix.

3. Removal of the inflamed and obstructed appendix is generally followed by a complete and instant relief of all former dyspepsia. The cessation of symptoms may, however, come only by degrees and with a lapse of many weeks.

4. No operation for supposed gastric or duodenal ulcer is complete until an examination has been made of the appendix, small intestine, and mesenteric glands (that is of the midgut).

5. If, in such an operation, no lesion can be found in the stomach or duodenum, it is not permissible to perform any operation such as gastro-enterostomy. This operation has results not surpassed by any other when performed in strictly appropriate cases. It is worse than useless in chronic appendicitis.

6. The mimicry of the symptoms of gastric ulcer in these cases is due to an exaggerated action of the pylorus. This tumult of contractile activity can be recognized when the stomach is inspected.

7. Investigation is necessary to ascertain the frequency with which the mucous erosion of the stomach (the “acute” or “medical” ulcer) is dependent upon a primary lesion in the appendix or intestine.

“APPENDICULAR GASTRALGIA.” Paterson treats of practically the same condition as does Moynihan, but chooses the term “appendicular gastralgia” rather than “appendix dyspepsia.” His conclusions are as follows:

1. Appendicular disease may give rise to symptoms which closely mimic the supposed symptoms of gastric and duodenal ulcer.

2. The prominent symptom is epigastric pain or severe discomfort after food; in many cases there are sour eructations, vomiting, and even hematemesis and melena.

3. The radiation of epigastric pain to the lower abdomen is very suggestive of appendicular trouble.

4. Gastric analysis reveals, in some cases, hyperchlorhydria; in others, a normal amount of free HCl; in others, a marked diminution or absence of free HCl. As a rule, there is an increase of the volatile acids, and in some cases evidence of hypersecretion.

5. Some cases of hypersecretion or acid dyspepsia and many cases of supposed gastric or duodenal ulcer are due to latent appendicular disease.

6. The evidence that the gastric symptoms are due to appendicular disease is three-fold: (*a*) the majority of the patients are cured by appendectomy; (*b*) the influence which appendectomy has on the gastric contents, and (*c*) the frequency of a previous history of gastric symptoms in those who have an attack of acute appendicitis.

7. The symptoms are probably the result of intestinal toxemia, due to intestinal stasis. The effect on gastric secretion is, in the early stages, possibly due to pyloric spasm, but more probably to some influence of the appendix upon gastric secretion.

8. Appendicular gastralgia is apparently more common in women than in men.

9. The important lessons to be learned from these cases are the following: (1) That no operation should be performed on the stomach except when a definite organic lesion of the stomach or duodenum exists. Gastrojejunostomy will not cure appendicitis. (2) That in all operations for supposed gastric or duodenal ulcer the condition of the appendix should be carefully investigated.

Though we may be inclined to think that these gentlemen are being led into error by an excess of surgical enthusiasm, we must accept their opinions as worthy of great consideration and at least maintain an unbiased mind while awaiting further evidence upon the subject. It is very doubtful if a number of careful observers would be led to the same conclusions upon a subject, quite independently of each other, if there were not substantial grounds for their conclusions. When we realize, as a result of the physiological work of the past few years, how interdependent the various portions of the gastro-intestinal tract are upon each other, it appears by no means astounding that disease of one part, such as the appendix, should have a profound influence upon the functions of another, such as the stomach. It is, however, somewhat more difficult to comprehend the occurrence of the organic change that would seem necessary for the production of such phenomena as gastric hemorrhage as a result of appendicular disease. It has been claimed that the hemorrhage in these cases is due to sepsis, to

embolism of the artery of the stomach secondary to thrombosis in the omental branches, and to toxic influences which we do not at present understand. Paterson believes that the hemorrhages are due to superficial erosions resulting from the high degree of acidity which is so frequently present.

GASTRIC HYPERSECRETION. In the study of 112 consecutive cases of continuous gastric hypersecretion, Fenwick found in all of them some condition which he held responsible for the hypersecretion. These conditions were chronic gastric ulcer, chronic duodenal ulcer, gall-stones, or chronic appendiceal disease. Fenwick consequently divides gastric hypersecretion into three groups: Appendicular hypersecretion, biliary hypersecretion, and hypersecretion due to an ulcer (or its scar) in the vicinity of the pylorus on either its gastric or duodenal side. His conclusions are as follows:

1. Hypersecretion of gastric juice invariably depends upon an organic lesion, which usually takes the form of a chronic ulcer of the stomach or duodenum, calculus in the gall-bladder, or latent disease of the appendix, although it is probable that future investigations will prove that pancreatic calculus, tubercle of the cecum, and carcinoma of the appendix are also capable of producing it. Of the last named, one case has already come under my observation. This disorder of secretion is merely the physiological expression of a reflex irritation of the gastric glands, and is, therefore, not entitled to be regarded as a disease.

2. The continuous flow of a hyperacid gastric juice, whatever be its cause, always excites severe inflammation of the stomach, and is very liable to be followed by ulceration of that viscus or the duodenum. This secondary ulceration is at first superficial in character and may not be demonstrable upon examination of the exterior of the stomach. Minute hemorrhagic erosions, capable of producing alarming hematemesis and melena, are usually associated with, and caused by, this abnormality of the gastric secretion.

3. Latent disease of the appendix as a result of former acute inflammation is accompanied by a peculiar form of digestive disturbance. In this condition subacidity of the gastric juice with an absence of free hydrochloric acid is the rule.

4. With the exception of hemorrhage, all the symptoms that are regarded as pathognomonic of duodenal ulcer are in reality due to the gastric hypersecretion which always accompanies this lesion. It follows, therefore, that a severe example of hypersecretion may, as a rule, be safely diagnosticated as a case of duodenal ulcer.

5. Contrary to the usual belief, carcinoma of the pylorus is sometimes accompanied by extremely well-marked hypersecretion. In such cases the morbid growth develops with extreme rapidity, and violent hemorrhages, due possibly to digestion of the tumor, are exceptionally frequent.

DIGESTIVE HYPERSECRETION. Strauss¹ gives the results of his observation of 102 cases of digestive hypersecretion, a condition which he first described fourteen years ago. He concludes that the condition is a much more frequent one than is generally recognized. It is more frequent in men than in women, and is especially prone to occur in the young and middle aged. Usually the gastric motility is not disturbed, and the hypersecretion is by no means constantly associated with hyperacidity. In about one-fourth of the cases of digestive hypersecretion gastric ulcer is present, but it may be a symptom of many other disease conditions, especially constitutional neuroses, habitus asthenicus, chronic constipation, hernia, and chronic nicotine or alcohol poisoning. Its relationship to gastric ulcer makes it of significance in the diagnosis of the latter condition. Strauss believes that in all cases of digestive hypersecretion, especially if there are any other indications whatever of gastric ulcer, the appropriate treatment for the latter should be instituted.

In an article on "Functional Dyspepsia," which contributes nothing new to the subject, Drummond² pleads the necessity of attempting to discover the cause at the basis of the functional disorder in each individual case. He apparently interprets the functional dyspepsias in a somewhat unusual manner, for among their causes he enumerates the following: "Errors of diet, the bolting of food, dental deficiency and imperfect mastication, irregularity of meals, chronic bacterial intoxication, the abuse of alcohol or tobacco, constipation; or, on the other hand, they may be secondary to Bright's disease, phthisis, or other chronic debilitating disease."

CONDITIONS SIMULATING DYSPEPSIA. Hutchison³ discusses the conditions which simulate dyspepsia. He divides them into those which by reason of vomiting may resemble dyspepsia and those which by reason of the presence of pain may simulate dyspepsia. Among those conditions characterized by vomiting he mentions the vomiting of pregnancy, uremic and phthisical vomiting, vomiting in association with disease of the bladder or urethra, chronic intestinal obstruction, cerebral tumor, the gastric crises of tabes, and nervous or hysterical vomiting. The conditions which by reason of pain may simulate dyspepsia he tabulates as follows: Gallstones, angina pectoris, abdominal angina, colitis, chronic appendicitis, spinal caries, and pleurisy. He finally mentions eructatio nervosa or aërophagia as a condition which may simulate dyspepsia.

Büttner,⁴ in an article on the periodic gastric diseases, pleads for the recognition of a *periodic form of cardialgia*.

¹ Internat. Beitr. z. Path. u. Therap. der Ernährungsstörungen, 1910, Bd. i, Hft. 2, p. 161.

² British Medical Journal, 1910, No. 2567, p. 613.

³ Ibid., No. 2565, p. 485.

⁴ Archiv für Verdauungskrankheiten, 1909, Bd. xv, Hft. 3, p. 385.

The nature and varieties of the *gastric neuroses* are discussed by Schüle¹ and Bofinger.² Both articles are, however, of such an academic nature that they do not well lend themselves for discussion in these pages.

Pyloric Spasm. According to Schütz,³ though pyloric spasm is often spoken of and at times diagnosticated, there is little of a definite nature known of it. For this reason he devoted himself assiduously, over a period of many years, to the palpatory examination of the pylorus in both normal and diseased conditions, and arrived at the following conclusions:

1. There exists such a condition as pyloric spasm which under certain circumstances is susceptible of palpatory recognition.

2. In the palpatory diagnosis of this condition attention must be paid to the difference between a normal and a spastic contraction of the pylorus. A spastic contraction of the pylorus is characterized by either its continuance for many minutes at a time or its occasional cartilage-like firmness.

3. It is doubtful if an idiopathic pyloric spasm occurs, and also doubtful if hyperacidity or hypersecretion can by themselves produce pyloric spasm.

4. Organic changes in or about the pylorus are capable of exciting a pyloric spasm.

5. In conditions characterized by a stenosis of the pylorus, the occurrence of a pyloric spasm can favor the appearance of symptoms of the stenosis or the increase of symptoms already present. That pyloric spasm alone can lead to manifestations of stenosis is doubtful.

6. Pyloric spasm in cases of gastric ulcer in the neighborhood of the pylorus produces pain. In pyloric carcinoma, spasm of the pylorus as a rule, does not cause pain.

7. In cases of painful pyloric spasm it is advisable to place the patient upon treatment for gastric ulcer.

With our present diagnostic equipment it is, of course, impossible to decide many questions pertaining to functional or secretory gastric disorders, but I am inclined to differ with Schütz in regard to the occurrence of pyloric spasm as a result of hyperacidity, or hypersecretion alone. I have seen cases in which I am quite sure that painful spasm of the pylorus resulted from hyperacidity alone. One important reason for my belief that the hyperacidity was the cause of the pyloric spasm is that treatment directed alone to the hyperacidity abolished what was to all appearances painful pyloric spasm. Moreover, on the basis of purely theoretical reasoning, the occurrence of pyloric spasm as a result of hyperacidity is to be expected. If normal gastric

¹ Archiv für Verdauungskrankheiten, 1909, Bd. xv, Hft. 4, p. 444.

² Ibid., 1910, Bd. xvi, Hft. 3, p. 352.

³ Ibid., Bd. xv, Hft. 6, p. 714.

acidity by its influence on the duodenal reflex causes normal contraction of the pylorus it can be expected that a hyperacid secretion would cause a greater response than normal and thus induce an excessive pyloric contraction. The possibility, however, of a maximal response to all stimuli, as occurs, for instance, in the cardiac mechanism, must be admitted.

Tube for Dilatation of the Cardia. Elsner¹ has devised a new tube for dilatation of the cardia in cases of cardiospasm. It is a modification of the Gottstein tube, firmer and less flexible than the latter. Elsner has found it especially serviceable in those cases in which, on account of the high degree of dilatation of the esophagus, the Gottstein dilator is inclined to fold up in the esophagus.

Gastrostaxis. Several years ago Hale White described a condition to which he gave the name gastrostaxis, which is especially characterized clinically by gastric pain, vomiting, and hematemesis. When patients suffering with gastrostaxis have been operated upon, no gastric ulcer has been found, but instead there has frequently been observed an oozing of blood from various points of the gastric mucosa. After the article describing these cases was published, numerous clinicians and surgeons claimed to have seen cases conforming to White's description. In a recent article, Bolton² attempts to disprove that gastrostaxis exists as an independent disease. It must be first understood that cases in which the vomiting of blood occurs as a result of a profound anemia, or infectious disease, or purpuric conditions, or the toxemias associated with diseases of the liver and kidneys do not constitute instances of gastrostaxis. According to the original descriptions, the disease may occur in either sex but is more common in females than males, and occurs most commonly between the ages of twenty and forty. It has a special tendency to recur at intervals, and between the attacks the patients are quite free from gastric symptoms.

According to Bolton, the claim that gastrostaxis exists as an independent condition rests upon the three following hypotheses: (1) That at certain postmortem examinations of patients who have died of hematemesis no lesion has been found in the stomach to account for the bleeding; (2) that at certain operations performed upon such patients an ulcer has not been found; (3) that gastrostaxis possesses a definite clinical history.

In regard to the claim that at the postmortem examination of patients who died of hematemesis no lesion has been found in the stomach to account for the bleeding, Bolton believes that in the majority of these cases a lesion did exist but was probably overlooked by the pathologist. This lesion he believes to be an acute gastric ulcer. The question is one of such importance that we will quote Bolton's remarks

¹ Deutsche med. Wochenschrift, 1910, No. 4, p. 169.

² British Medical Journal, 1910, No. 2577, p. 1221.

in regard to the appearance of and examination for small acute gastric ulcers:

"When moderately stretched out at an autopsy the thickness of the stomach walls is about 4 mm., the mucous membrane being about 1 mm., so that an ulcer reaching to the muscular coat must necessarily look shallow and especially so in proportion as its area is large. This shallow appearance almost forces the observer to call the lesion an abrasion or erosion and to consider it as of little moment. I do not forget that much of the congestion of an acute ulcer probably disappears after death.

"Acute ulcers vary in diameter from about the size of a split pea to an inch. Small acute ulcers and the scars of acute ulcers are very easily overlooked at postmortem examinations, and an ulcer may be cut through in opening the stomach and so obliterated. All writers agree upon this point and I think there is no doubt that many stomachs have been described as being free from any evidence of ulcer owing to the employment of a method of examination not sufficiently minute. For such an investigation, the stomach should be placed in warm water so as to relax the muscular coats, and first examined in front of a light for opacities in the mucous membrane. It should then be pinned out on a board after being moderately stretched, and the surface should be well washed with a camel's-hair brush, and carefully examined all over by means of a lens. Even now a scar may be missed. The specimen should then be hardened for twenty-four hours in 5 per cent. solution of formalin, and dried by washing in methylated spirit. Stellate scars can be much easier seen in the dry state, and if the specimen be photographed they are seen with greater ease still. The radiating lines are exaggerated by the photographic plate.

"Hardening in formalin, of course, takes the color out of the specimen, but I am presuming that the specimen has already been examined in the fresh state and all possible information gained from the presence of blood. The scars of acute ulcers are not always stellate in form. The only evidence of a scar may be a slight opacity of the mucous membrane which is adherent to the muscular coat at that spot.

"If the ulcer has perforated the muscular coat and has been at all extensive, the resulting scar will be a small surface very slightly depressed below the surrounding mucous membrane, but otherwise looking quite like it. The surrounding mucous membrane may be slightly puckered or not. The scar is always very much smaller than the ulcer from which it has resulted, and it often tends to be oblong, or like a small fissure, and may be quite invisible until the stomach is stretched. The area of such a scar may be less than a fifth of that of the ulcer preceding it, as I have been able to show experimentally."

In regard to the claim that at operations performed upon patients with gastrostaxis no ulcer has been found, Bolton does not think that

this fact carries much weight. In those cases in which a number of bleeding points were found, he thinks it probable that all such were minute acute gastric ulcers. In this connection he calls attention to the fact that in one case twenty acute ulcers were found at an autopsy.¹ In those cases in which no ulcer at all was found, he thinks it very possible that in the difficulty of examining the interior of the stomach during operation an ulcer was probably overlooked. He quotes the following from Mansell Moullin:²

"During life the ordinary acute ulcer of the stomach usually takes the appearance of a linear or triradiate fissure, out of which the blood trickles in a steady, continuous stream. Postmortem, when all the congestion and edema have gone, the arteries, especially in a patient who has died from loss of blood, contract to such an extent that they appear to be quite insignificant in point of size, and a lateral opening, such as is usually present, is almost certain to be overlooked. Unless the bloodvessels of the stomach are injected, or some special examination is made, the bleeding point is scarcely ever found in an acute ulcer, and the loss of blood is almost certain to be laid to the credit of the capillaries."

In regard to the claim that gastrostaxis possesses a definite clinical history, Bolton believes that there is a condition characterized by periodic attacks of pain, vomiting, and hematemesis, in the intervals of which the patient is quite well but believes that this condition consists in recurrent attacks of acute gastric ulcer. He believes that recurrent attacks of acute gastric ulcer occur with much more frequency than is generally recognized in the present-day teaching. Within a period of six months he observed three cases in which the scars of old ulcers were present in the stomach, together with recent acute ulcers.

Spriggs³ apparently also doubts the independent existence of such a condition as gastrostaxis, as indicated by the following remarks in an article on gastric ulcer:

"Cases of severe hematemesis have been described in which no definite ulcer could be found at an operation or postmortem. I am not now referring to the multiple hemorrhagic erosions occurring in a number of toxemic states, such as pneumonia, appendicitis, and anemia, and in severe gastritis, but to the vomiting of blood in patients with the symptoms of gastric ulcer. Recently Dr. Hale White has described this in this country under the title 'gastrostaxis.' I shall include such cases of hematemesis with gastric symptoms in young people as cases of acute gastric ulcer; in some of them the existence of a little ulcer involving a vessel has been proved by minute examination. I have seen such myself. The great difficulty of demonstrating

¹ Affleck, *Lancet*, 1901, vol. i, p. 478.

² *Transactions of the Clinical Society*, vol. xxxvi, p. 89.

³ *British Medical Journal*, 1910, No. 2577, p. 1216.

a small lesion in the rugose lining of the stomach must be remembered. At an operation it is impossible to be sure that a small ulcer or fissure is not present, and after death it is quite easy to miss one, even when the stomach is carefully cleaned out. It appears likely that the lesions both in 'gastrostaxis' and in gastric ulcer arise from the action of the digestive juice upon disintegrated lymphoid patches. Lymphoid tissue is especially abundant in the stomach of the dyspeptic. Neither from the point of view of diagnosis nor, as we shall see, of treatment, is it of importance whether a small lesion involving a vessel is present or whether such a lesion has proceeded to the stage of a round ulcer."

White¹ replies to Bolton by calling attention to the fact that one of the patients in whom the latter diagnosed an acute gastric ulcer instead of gastrostaxis was a man, aged forty-nine years, the other a woman, aged sixty-nine years, so that neither one of these cases conforms to the description given by him. They, furthermore, could not well be confused with gastrostaxis after the postmortem examination, for in none of the cases was there any evidence that the bleeding came from a single point. In favor of the belief that gastrostaxis does exist, White gives the evidence of a number of observers who state that at operation or postmortem they have actually seen bleeding from a number of points or have seen evidence of the fact that there was such bleeding. Gullan² showed, at the Liverpool Medical Institution, the stomach and intestines of a girl, aged nineteen years, who had had all the symptoms of gastric ulcer, including hemorrhage. No ulcer could be seen in the stomach, but there were numerous small hemorrhagic erosions scattered over its mucous membrane and that of the duodenum and intestines. Herringham³ reports a case in which, upon opening the stomach after death, several small areas were seen from which hemorrhage had occurred, but there was no ulceration. Turning to cases observed during life, White calls attention to the fact that Eve⁴ speaks of seeing inside the stomach "small red points," and Moynihan⁵ speaks of "bleeding from many tiny points" and "the mucous membrane weeping blood." White⁶ also refers to numerous cases of the same nature described in his original report. He admits, as Dr. Bolton says, that the finding of multiple bleeding points is no evidence against the acute ulcer view, because acute ulcers are sometimes multiple; but many acute simultaneously active ulcers are very rarely seen at autopsy and most of the descriptions do not indicate the existence of acute ulcers; furthermore, the chances that numerous minute acute ulcers would be all quite close to one another and all bleed at the same time must be remote.

¹ British Medical Journal, 1910, No. 2579, p. 1347.

² The General Practitioner, December 8, 1906.

³ St. Bartholomew's Hospital Reports, vol. xlv.

⁴ British Medical Journal, May 7, 1910.

⁵ Ibid., January 29, 1910.

⁶ Lancet, November 3, 1906.

The question of the existence or non-existence of such a clinical entity as gastrostaxis is, I think, one of considerable importance. I have been rather inclined to believe in the existence of such a condition, though I have always felt that there was possibly some toxic condition responsible for the symptom complex. Hematemesis as a result of the extravasation of blood from the mucous membrane of the stomach and intestines is relatively common in severe toxic conditions, both chemical and bacillary, and I have felt that this may be the explanation of several cases which I have seen corresponding to the description of Hale White.

A case of this nature occurred several years ago in the service of Dr. Chas. H. Frazier, in the University Hospital. The patient, a young woman, presented all of the symptoms of gastric ulcer, excepting that there was a somewhat disproportionate prominence of hematemesis. At operation a most painstaking search of both the internal and external surfaces of the stomach was made, but no gastric ulcer could be discovered. Inspection of the mucosa, however, revealed the presence of several bleeding points despite the fact that the mucous membrane seemed quite intact.

Another possibility in regard to these cases is the claim of Moynihan, already discussed, that they are instances of "appendix dyspepsia."

In this connection it is a rather interesting fact that the older clinicians used to look upon hematemesis resulting from the oozing of blood from the gastric mucosa as a not very uncommon occurrence in patients suffering from locomotor ataxia.

Whether or not we are inclined to accept the independent existence of gastrostaxis as a fact, Bolton's remarks in regard to the ease with which small acute gastric ulcers may be overlooked compel us to take a very critical attitude toward the subject and oblige us to make most careful search, according to his directions, for acute gastric ulcers in all patients dying with symptoms of gastrostaxis. Unfortunately not many patients suffering with the disease, or symptom complex, as it were perhaps, better considered, succumb during its active stage. However, an extremely critical attitude associated with careful observation on the part of surgeons and pathologists will undoubtedly result in the solution of the problem.

Habitus Asthenicus. Considering the important bearing that it has upon many gastro-intestinal diseases, habitus asthenicus is a condition which in our teaching has not received sufficient attention. We are especially indebted to Stiller¹ for the most complete exposition of the full significance of habitus asthenicus, especially in its relation to gastro-intestinal medicine. From the viewpoint of the gastro-enterologist, habitus asthenicus is etiologically of importance in connection with the functional gastric disorders and with visceroptosis. Whereas, in

¹ Die Asthenischen Konstitutionskrankheit., Stuttgart, 1907, Enke.

regard to the latter condition, Glenard's teaching had been that of a purely local mechanical fault, Stiller caused it to be looked upon more as a manifestation of a general constitutional deficiency.

Strauss¹ gives a very good, concise résumé of the general characteristics and significance of *habitus asthenicus*. The condition is characterized by many external features of which an affected individual may manifest only a few. Of special importance are the delicate frame, the pallor which is frequently present, the deficient development of muscles and subcutaneous fat, the somewhat prominent development of the skull as compared with the face, the long narrow face, the narrow lower jaw and high roof of the mouth, the long neck and the long trunk, especially in its abdominal portion, and the narrow, flat thorax; commonly both the upper and lower apertures of the thorax are unusually small; the epigastric angle is remarkably narrow, and, according to Stiller, a further important characteristic of the thorax is a floating tenth rib; the pelvis is unusually small and in the female a deficient amount of fat is found in the *mons veneris* and the *labia majora*; there is, moreover, frequently a deficient growth of hair and the *mammæ* are underdeveloped; occasionally a slight scoliosis is noted.

There are many interesting features which may be looked upon as more or less the direct results of the asthenic habitus, such as *neurasthenia*, *anemia* or *pseudo-anemia*, disturbed cardiac action, and a tendency to tuberculosis. However, we must confine our attention to the gastro-intestinal features associated with the condition. Here we find, of special importance, the "irritable weakness" of the digestive organs and the *ptosis* which they suffer in common with all of the abdominal viscera. This is in no sense a true acquired *ptosis*, such as occurs in individuals of vigorous bodily conformation who, by reason of a weakening of the abdominal wall, lose the support that the abdominal viscera are accustomed to; it is rather a postural adaptation of the organs to the long narrow abdominal cavity to which they must accommodate themselves. Thus the stomach takes an almost vertical position, and its lower margin consequently appears to be abnormally low. On account of their position and the thin abdominal wall covering them, splashing sounds are remarkably easily elicited in these stomachs when palpated by the Obrastzow method. Uncomplicated cases of this type do not necessarily suffer with gastric symptoms referable to the abnormal position of the stomach, for, according to investigations of Strauss and Leva,² when uncomplicated, the motor functions in these stomachs are normally performed.

The transverse colon sinks low in the abdomen and thus frequently leads to obstinate constipation. The resultant kinking of the hepatic

¹ *Berliner klinische Wochenschrift*, 1910, No. 5, p. 207.

² *Zeitschr. f. klin. Med.*, Bd. lxxv, Hft. 3 and 4.

and splenic flexures often gives rise to painful collections of gas. As a consequence of these conditions, various degrees of colitis may occur.

The other condition observed in the gastro-intestinal system as a consequence of habitus asthenicus, the so-called "irritable weakness," is of fully as much importance as the visceroptosis. It manifests itself in the stomach in all forms of functional gastric disorder, in all the types of "nervous dyspepsia," in hyperesthesia, hyperchlorhydria, and digestive hypersecretion. It is possible that the latter conditions may predispose to the development of ulcer and thus indirectly, according to Strauss, we have an etiological relationship between habitus asthenicus and gastric ulcer.

The nature of habitus asthenicus has been a matter of much discussion. Tuffier¹ looks upon it as a purely congenital condition, as does also Stiller, who speaks of it at times as "*asthenia congenita*." Strauss, on the other hand, believes that there is a congenital predisposition to the condition, but that it first comes into existence about puberty, in other words, that there is a retardation of development which institutes itself at about puberty. Fortunately this question is not of great importance from the therapeutic standpoint, for in either case treatment must be directed against the general constitutional deficiency.

Treatment must have as its aim improvement in the general bodily tone by all available means; by the administration of the proper amount and character of food, by a regulation of the amount of rest and exercise, by hydrotherapy, by the administration of tonic drugs, by change of climate if necessary, and by correcting any fault in life habits that may be discoverable. If the beginning of the habitus asthenicus can be recognized about puberty, everything must at once be done to counteract the development of the condition. This, however, seldom falls to the lot of the gastro-enterologist. The patient comes to him only after the condition is fully developed and symptoms are present referable to some particular organ, usually the stomach. It is then the great and important duty of the physician to recognize that the symptoms are but the local manifestations of a constitutional defect and that treatment, to be effective, must be primarily directed against this constitutional defect. My belief in the importance of this is firmly established. It has been my lot to meet a relatively large number of cases of functional gastric disease and of their frequent association, and, in the majority of cases, dependence upon an asthenic habitus I am firmly convinced. I feel that it cannot be too forcibly emphasized that the treatment in these cases must be primarily directed against the constitutional weakness. If the local manifestations are subject to correction the appropriate treatment must naturally also

¹ Semaine médicale, 1894.

be instituted, but the patient must be protected from any radical procedure, especially of a surgical nature, if it be possible, for with the unstable nervous systems that most of these patients possess they do not stand surgical operations well, and in the majority of cases such a procedure is without lasting benefit for it does not strike at the basis of the condition. Even though it is necessary to resort to radical local measures, a general invigorating line of treatment, such as indicated above, must be employed as soon as it is possible.

Gastroptosis and Chronic Joint Diseases. Goldthwait and Brown¹ believe that gastroptosis and enteroptosis are factors of great importance in the etiology of rheumatoid arthritis. It is their opinion that the malposition of the stomach and intestines causes the elaboration of chemical or bacterial toxins, the absorption of which probably causes the joint changes. There is no doubt that many cases of so-called rheumatoid arthritis are dependent upon the absorption of toxins from the gastro-intestinal tract. I doubt, however, if gastroptosis, unless there be associated with it other evident derangements of the gastro-intestinal tract, will often be found to be the cause of serious joint disturbances. The mere postural abnormality of the stomach of itself probably produces little general disturbance; if it be severe enough, or of such a type as to produce any such general disturbance as rheumatoid arthritis, it will undoubtedly first manifest itself in profound gastro-intestinal disturbances.

A most commendable article on the treatment of gastroptosis is that by Hutchison.² He divides the treatment of gastroptosis into the treatment of the general state of neurasthenia which usually accompanies the gastroptosis, and the treatment of the functional disorder of the stomach and intestines. It can be judged from this that Hutchison does not recognize in the mere postural abnormality of the stomach itself any indication for treatment. The neurasthenia he treats according to generally recognized methods. The functional disorder may consist in (1) impairment of motility and tone, (2) disorder of secretion, or (3) increase of sensibility. These conditions he treats according to the individual requirements of the case. In regard to a support for the misplaced organs, he considers the best support to be an abundant layer of abdominal fat and a firm abdominal wall. The former he attains by dietetic measures, the latter by massage, exercises, and hydrotherapy. After giving directions as to what to do for gastroptosis, he makes some suggestions as to what *not* to do. He says (1) that these patients should not be overdieted; (2) that their stomachs should not be washed out; and (3) that they should not be operated upon. I thoroughly agree with Hutchison's suggestions but it must be recognized that occasionally one meets patients in whom there is such a degree

¹ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 21, p. 695.

² British Medical Journal, 1910, No. 2575, p. 1102.

of motor disturbance of the stomach that lavage is servicable, and sometimes operation must be resorted to.

Neutralon. Rosenheim and Ehrmann¹ give the results of their use of a new gastric remedy, *aluminum silicate*, which is furnished by the firm of Kahlbaum & Co. under the name of Neutralon. It is claimed to possess the advantage over other neutralizing agents of not being attended with the generation of CO₂ and of remaining in powdered form even after neutralizing the acid gastric juice. As a result of their use of the drug, the authors come to the following conclusions:

1. Neutralon is an extremely serviceable drug in reducing the acidity, stilling the pain, and beneficially influencing digestion in all irritable secretory disturbances of the stomach, such as hyperacidity and hypersecretion, whether they are primarily nervous or organic. It proved itself to be especially valuable in stubborn cases of hypersecretion of both the alimentary and continuous form, associated with more or less motor insufficiency of the stomach. There was always, in these cases, a diminution in the secretory energy of the stomach as well as a decrease in the hyperacidity and hypersecretion noticeable in the fasting stomach. It was noted, moreover, that neutralon frequently gave these patients considerable ease when other means, especially alkalies, had failed to do so even after long-continued use.

2. In a number of cases, the beneficial influence of neutralon in general gastric hyperesthesia, in association with anemia and chlorosis, was noted.

3. In gastric ulcer, neutralon had a decidedly beneficial influence upon the manifestations due to the hyperacidity, but it did not seem to be so efficient in promoting cure as large doses of bismuth sometimes do.

4. The most beneficial method of administering neutralon is to give one-half to one teaspoonful in about 100 c.c. of water a half hour to an hour before meals, three times a day.

Rosenheim and Ehrmann note further that larger doses than a teaspoonful can be taken without any harm or discomfort, as the drug is odorless and practically tasteless; they never saw any unpleasant manifestations from its use. They think that the drug may be of service in intestinal disorders, for they believe they are justified in assuming that the aluminum chloride resulting from the action of the hydrochloric acid of the gastric juice on the neutralon will exert an inhibitory action on the growth of intestinal bacteria.

It is quite possible that neutralon is fully as serviceable a drug as these conclusions indicate it to be. However, the opinion of German observers in regard to a proprietary drug must be taken with consider-

¹ Deutsche med. Wochenschrift, 1910, No. 3, p. 111.

able reserve, for in Germany men of even the highest scientific reputation may permit themselves to be employed for the exploitation of proprietary remedies without losing caste.

Activity of Pepsin, Pancreatin, and Trypsin. Peters and Frank¹ made a study of the activity of various pepsin, pancreatin, and trypsin preparations on the market. They came to the conclusion that most of the pepsin preparations are so inactive that little more than a psychological effect can be expected from their use. The pancreatin and trypsin preparations proved themselves to be more active, and in cases of anacidity some benefit to gastric digestion can be expected from their administration. Their use is especially indicated as an addition to nutrient enemata.

Operation for Gastric Crises. Since Foerster's suggestion of sectioning the posterior spinal roots from the fourth to the eleventh dorsal vertebrae in cases of severe uncontrollable gastric crises in locomotor ataxia, several cases have been operated upon with apparently excellent results. Bruns and Sauerbruch² report such a case. The patient who had lost fifty-eight pounds (German) gained forty-five pounds in a month and a half immediately succeeding the operation, and was able to return to his work with perfect comfort.

The Stomach in Pulmonary Tuberculosis. Various studies of the gastric secretion in pulmonary tuberculosis have been made. Brieger³ investigated 64 cases of pulmonary tuberculosis in various stages and found normal secretion in 50 per cent. of the cases in the first stage, 33 per cent. of those in the second stage, and 16 per cent. of those in the third stage. Immermann⁴ observed 38 cases in all stages, and found an absence of hydrochloric acid in only 6. He consequently concluded that insufficiency of gastric secretion is infrequent in phthisis. Schetty,⁵ and Croner,⁶ as a result of their studies, arrived at the same conclusion as did Immermann. Klemperer, in 10 patients⁷ suffering with early pulmonary tuberculosis, found 1 case of hypoacidity and 9 cases of hyperacidity; in 4 cases of terminal phthisis he found anacidity. Janowski⁸ claims to have frequently found achylia in patients suffering with pulmonary tuberculosis. Noltenius⁹ examined 241 sanatorium patients and found derangements of gastric secretion in 53 per cent.; 39.5 per cent. in the first stage, 49 per cent. in the second, and 64.1 per cent. in the third stage. Hayen¹⁰ reported the result

¹ Münchener med. Wochenschrift, 1910, No. 17, p. 911.

² Mitteilungen aus den Grenzgebiete. der Med. u. Chirurg., 1909, Bd. xxi, Hft. 1.

³ Deutsche med. Wochenschrift, 1889, No. 14.

⁴ Verhandl. des VIII Kong. f. inn. Med., 1889.

⁵ Deutsch. Arch. f. klin. Med., 1889, Bd. xlv.

⁶ Deutsche med. Wochenschrift, 1898, No. 48.

⁷ Berliner klinische Wochenschrift, 1889, No. 11.

⁸ Zeit. f. Tub., 1907, Bd. x, Hft. 6.

⁹ Dissert., Berlin, 1909.

¹⁰ Congrès pour l'étude de la tub., Paris, 1893.

of his investigation of the gastric secretion of 80 patients suffering with pulmonary tuberculosis. In incipient tuberculosis he found hyperpepsia remarkably frequent; in the more advanced stages hypopepsia was the rule; of 48 well-marked cases, 33 showed hypopepsia, and 12 practically complete apepsia. Hildebrandt,¹ in a study of 40 patients suffering with phthisis, found hydrochloric acid to be present in all cases in which there was no fever, but found it absent in all febrile cases. Rosenthal² made a similar observation. Begstrup-Hansen³ made an exhaustive study of 400 cases of phthisis in various stages of the disease. In men, he found anacidity or subacidity in 20.6 per cent. of the cases in the first stage, 36.5 per cent. of the cases in the second stage, and 36.6 per cent. of the cases in the third stage. In women, he found anacidity or subacidity in 30 per cent. of the cases in the first stage, 40 per cent. of the cases in the second stage, and 34.9 per cent. of the cases in the third stage.

Permin⁴ reports a large series of investigations of the secretory functions of the stomach in patients suffering with phthisis in its various stages, and in a number of far-advanced cases supplements these findings by histological investigations of the stomach. His results may be summarized as follows:

Anacidity and subacidity occur in patients suffering with phthisis in the following frequency: in the first stage, 23 per cent.; in the second stage, 34 per cent.; in the third stage, 47 per cent.; in extremely advanced stages, during the last half year of life, 75 per cent. The great increase in the frequency of anacidity and subacidity late in the third stage occurs especially in the twelve to six months before death. Pepsin and rennin are usually absent or in very small quantities in those cases in which there is anacidity or marked subacidity. In the advanced stages of pulmonary tuberculosis, marked evidences of gastritis are histologically demonstrable in about 75 per cent. of the cases. This gastritis appears to originate on the surface of the mucous membrane and to extend toward the deeper layers. It is practically always most marked in the pyloric portion of the stomach. In this gastritis an increase of the connective tissue is seldom observed, and even then is present to only the slightest degree. A characteristic feature in many of these cases is the occurrence of hyaline bodies in the mucous membrane. This was especially common in those cases in which there was a considerable degree of atrophy.

As a result of his studies, Permin feels justified in concluding that the all-important cause of the achylia or subacidity occurring in phthisis

¹ *Deutsche med. Wochenschrift*, 1889, No. 15.

² *Berliner klinische Wochenschrift*, 1888, No. 45.

³ *Den danske Nationalforening til Tuberkulosen Bekæmpelse*, Kopenhagen, 1907.

⁴ *Internat. Beitr. z. Path. u. Therap. der Ernährungsstörungen*, 1910, Bd. i, Hft. 2, p. 129.

is a true gastritis, and that there is a definite relationship between the severity of the gastritis and the degree of the secretory disturbance.

Effect of Purulent Discharges from Nasal Cavities on Stomach. Zabel¹ contributes an article on the influence of purulent discharges from the nasal cavities or accessory sinuses, on the stomach. The direct effects noticeable from the presence of the pus in the stomach are various alterations in gastric secretion, the discharge of small particles of mucous membrane, and the occurrence of living flagellates. The presence of the latter, according to Zabel, is due primarily to the neutralization of the acid gastric secretion by the alkaline purulent discharge. He thinks that the discharge of small particles of the gastric mucous membrane indicates the presence of erosions which may later give rise to ulcers.

As further results of the influence of these purulent discharges on the stomach, Zabel notes intestinal fermentation and a decrease in general bodily vigor. He advises a thorough investigation of the nose and pharynx in all cases of gastric disorder in which the cause is not apparent, and especially in cases in which the predominant symptoms are present in the early morning or when pus is found in the empty stomach.

Phlegmonous Gastritis. Adams² reports a case of acute primary phlegmonous gastritis apparently caused by the pneumococcus. In reviewing the statistics of phlegmonous gastritis, Adams concludes that no authentic case of recovery has thus far been reported. Those cases reported as recoveries were in all probability instances of abscess of the stomach wall.

Microgastric. According to Eppinger and Schwarz,³ pathologically small stomachs may result from diffuse infiltrating scirrhus carcinoma, from chronic sclerosing gastritis, and from inanition atrophy as a result of esophageal carcinoma or external pressure. There is, in addition, according to the descriptions of Rokitsky, a congenital smallness of the stomach.

Eppinger and Schwarz report an interesting case of small stomach which, according to skiagraphic examination, measured 8 cm. in length by 2.5 cm. in width in its greatest diameter. The only symptoms presented by the patient, a woman, aged thirty-five years, were periodic attacks of nausea and vomiting. The authors made a tentative diagnosis of luetic ulceration of the stomach with subsequent cicatrization. The excellent state of the patient's nutrition and vitality, to their minds, practically excluded the existence of either an infiltrating carcinoma or a sclerosing gastritis.

¹ Deutsche med. Wochenschrift, 1910, No. 17, p. 797.

² Lancet, 1910, No. 4509, p. 292.

³ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 3, p. 286.

DISEASES OF THE INTESTINES

Duodenal Ulcer. There is no doubt that we owe a great deal of our knowledge of the diseases of the upper abdomen, especially of the pancreas, the bile passages, and the stomach, to the surgeons. For this reason we are obliged to treat recent remarks by Moynihan¹ on duodenal ulcer with a great deal of thoughtful consideration, regardless of how startling and extravagant they may seem to be. Moynihan's opening remarks are as follows:

"There are few diseases of which the symptoms appear in such a definite and well-ordered sequence as is observed in duodenal ulcer. It is true that there are cases, of which fuller details must presently be given, in which the regular appearance of the symptoms is absent, or in which one symptom is so exaggerated as to dwarf, or even destroy, the value of others. But these exceptions are few, and they do not belittle the value of the general statement that the symptoms of duodenal ulcer are definite and not easily to be mistaken, and that they appear in an order and with a precision which are indeed remarkable."

In discussing these symptoms which so accurately permit of a diagnosis, Moynihan calls special attention to the length of time that the patient has suffered with them. They have usually been present for many years before the patient seeks medical aid, and, in response to the question as to how long he has suffered, the patient not infrequently replies "all my life," or "as long as I can remember." The age at which the patient usually comes to the physician is between twenty-five and forty-five, and males are more frequently affected than females.

At first the patient usually complains of a sense of weight, oppression, or distention in the epigastrium after meals. In the beginning, the discomfort does not occur at a definite period after each meal, but it is not long before notice is taken of the fact that it comes usually two hours or a little more after food has been taken. Immediately after a meal there is ease; if pain or discomfort were present before, the meal relieves them and banishes them completely for a time. Then, again, the pain is felt in two hours, three hours, four hours, or sometimes even six hours later. As a rule, the pain is at first slight and gradually increases, and, as it becomes more severe, is usually accompanied by a sense of fullness or distention. Frequently there are eructations of gas or bitter fluid which for a time afford some relief. The interval between the taking of food and the onset of the pain is very remarkable, it is constant from day to day if the character and quantity of the food remain the same. If the food is entirely liquid, the pain comes rather earlier; if it is heavy, solid, or "indigestible," the pain comes later; with

¹ *Lancet*, 1910, No. 4505, p. 21.

an ordinary meal of liquid and solid food the pain very rarely appears in less than two hours. Continuing, Moynihan says:

“Many patients will volunteer the statement that the pain commences ‘when they are beginning to feel hungry,’ and I, therefore, suggested in one of my early papers the term ‘hunger pain’ as descriptive of this particular symptom. The pain, as a rule, is noticed at first only or chiefly after the heaviest meal of the day. If dinner is taken between 1 and 2 P.M., the pain will come with unvarying regularity at, or near, 4 P.M. For a long period this may be the only time when discomfort is felt, but later in the attack, or in subsequent attacks, it is noticed that after every meal the pain comes at its characteristic interval, that by every meal the pain is relieved, only to return in due time. When inquiry is made from a patient as to whether food causes the pain he will not seldom answer, ‘Oh, no, food always makes the pain better; the pain comes when I am beginning to feel hungry.’ It is very characteristic of the pain that it wakes the patient in the night, and the time of waking is constantly said to be two o’clock. The relief of the pain by food, quickly realized by patients themselves, leads to the practice of keeping near at hand a biscuit or some other food or drink which can be taken at once. Many patients carry a biscuit in the pocket, or have a glass of milk and a piece of bread and butter ready at certain times to be taken at the moment of the onset of pain. It is a common experience to find that patients place by their bedside some food to be taken in the early hours of the morning when the pain awakens them. The regular appearance of the pain after definite intervals from the taking of food is remarkable and is consistent.

“The pain is often preceded or accompanied by a sensation of weight, or of fulness and distention in the epigastrium; it is described as boring, gnawing, or burning. It may be relieved by belching, and constant efforts are often made to bring about the eructation of gas, which is followed by momentary relief. Sometimes there may be a slight regurgitation of food, and the patient complains that the taste of this is bitter or acid; the throat then feels hot, or as if scalded, and the teeth are said to feel as if made of chalk. A few patients complain that when the pain is beginning to develop a free gush of saliva may occur. The swallowing of this may give temporary relief from the pain. In some cases the flow of saliva may be copious and distressing.

“For long periods, sometimes throughout the history of a case, the pain remains confined to the epigastrium, but it may strike through to the back or pass around the right side. When the pain is severe, relief is often gained by pressure, and I have known patients, wakened in the night, to hug a pillow to the abdomen to obtain relief in this way. On some occasions, though this is infrequent, the pain is said to be cramp-like in character, a sort of spasm is felt with exacerbations and remissions, as in all forms of colic. . . .

"Throughout the whole period during which the pain is felt, the appetite remains good. In many cases the patient volunteers the statement that he feels a keen relish for his food, takes it with good appetite, and enjoys it. Frequently he eats less than he feels he would enjoy, because experience has taught him that excess, or even satisfaction, is apt to be followed by an increase of pain, or pain of a more enduring character. Fluid food, when taken to the exclusion of all solids, often causes the pain to come earlier after food and to last longer than when the ordinary meals are taken. A patient will often say that he feels worse when he is strictly dieted in this way, but, as a rule, persistence in liquid diet, especially during the earlier stages of the disease, will bring relief after a time. Vomiting is very infrequent; it is rarely present until stenosis develops, and stenosis appears in the later periods when the ulcer or ulcers are healed. The majority of the patients upon whom I have operated have never vomited.

"These are the characteristic symptoms described by the patient in the anamnesis. Upon them alone a confident diagnosis of duodenal ulcer may be made. Perhaps the most characteristic feature of duodenal ulcer is the periodicity of the symptoms, their recurrence from time to time in attacks, and their complete abeyance in the intervals. A patient, who has suffered for years, will say that an attack comes on as a result of exposure to cold, or getting the feet wet, or after a hasty, indigestible meal, or from worry, or overwork. A cause can almost always be assigned for the onset of symptoms; a recurrence of the cause is always followed by a reappearance of the symptom. The most common of all these causes is 'getting cold'; in consequence, the great majority of the patients will say that the attacks are especially prone to come in the winter months—December, January, or February. In the summer the symptoms are almost always absent. . . .

"The attacks vary in length from two to three weeks up to several months. It is remarkable that an attack may frequently be cut short by a few days' rest in the country or at the seaside. . . .

"These symptoms, so perfectly characteristic of duodenal ulcer, may be present for years without producing any physical signs. It is, therefore, not necessary to the attaining of an accurate diagnosis that any examination of the patient be made. The anamnesis is everything, the physical examination is nothing. There is, in the stage when the presence of the ulcer should be recognized, no single physical sign indicating the presence of organic disease. Signs which confirm the accuracy of the diagnosis may appear later, but there is no need to await their arrival before making, as we can make with the utmost confidence, an exact diagnosis."

Other writers do not look upon the diagnosis of duodenal ulcer as such a well-defined and simple matter. Ewald¹ considers the diagnosis

¹ Berliner klinische Wochenschrift, 1910, No. 5, p. 180.

of duodenal or gastric ulcer from inflammatory processes of the gall-bladder, cholelithiasis, chronic inflammatory, or neoplastic affections of the pancreas, and occasionally appendicitis, to frequently be extremely difficult. If the presence of blood can be definitely demonstrated in either the stomach contents or the feces, it almost unconditionally limits the diagnosis to gastric or duodenal ulcer, for hemorrhage occurs with the greatest infrequency in any of the other conditions enumerated as being concerned in the differential diagnosis. However, even in gastric and duodenal ulcer hemorrhage is frequently absent. According to Ewald, in 662 cases in the Augusta Hospital between 1891 and 1908, blood was demonstrable in 373, or 56.3 per cent. of the cases. During the earlier years included in this series blood was not looked for in the feces with the care that it is nowadays; nevertheless, the difference in the figures dependent upon this fact could not be so great as to warrant the statement that blood is demonstrable in all cases of gastric or duodenal ulcer.

If the diagnosis is limited to ulcer of the stomach or duodenum, Ewald enumerates the following characteristics as of value in the differential diagnosis of ulcer in these two locations:

1. In duodenal ulcer pain occurs later than in gastric ulcer, that is, about three or four hours after the taking of food. Men are more frequently the subjects of duodenal ulcer than women (about four to one).

2. In duodenal ulcer the pain is farther to the right than in gastric ulcer; in the majority of cases it is independent of the character of the food, that is, it occurs as well after light foods as after heavy foods.

3. Patients with duodenal ulcer often complain of cold hands and feet, that is, they suddenly become cold as an attack of pain is ushered in.

4. Dorsal painful points are inconstant and occur at least as irregularly as in ulcer of the stomach.

5. When a gastric ulcer is situated near the pylorus, the latter can frequently be either continuously or intermittently palpated as a result of pylorospasm; in ulcer of the duodenum this is not true unless there be malignant degeneration, as the ulcer is flatter and is not associated with muscular hypertrophy.

6. In gastric ulcer the vomitus consists of food remnants or blood. Vomiting occurs more frequently and with more ease than it does in duodenal ulcer, provided there is no pyloric stenosis with consequent gastrectasis. In a typical case of duodenal ulcer, food remnants are first vomited, then bile, then blood. The examination of the stomach contents relative to the acidity is of no significance in the differential diagnosis.

7. In duodenal ulcer there is more frequently melena without hematemesis, in gastric ulcer more frequently hematemesis without melena.

In 28 cases of gastric ulcer Thomson¹ found hematemesis in 81 per cent., and melena but once; in 22 cases of duodenal ulcer hematemesis was present in 59 per cent. and melena in almost every case.

Ewald thinks that we make the diagnosis of duodenal ulcer much too simple a matter when we attempt to establish it, as Moynihan claims is possible, on the basis of "hunger pain" alone, and speaks of a case mentioned by Hertz in which the patient, a man, aged twenty-six years, had complained of gastric symptoms, notably "hunger pain," for nine months. Moynihan diagnosticated duodenal ulcer and operated, but no ulcer was found. Ewald agrees with Hertz and Hutchison in that "hunger pain" occurs in many gastric disorders, especially those accompanied by hyperacidity.

Günzburg² agrees that "hunger pain" can by no means be looked upon as diagnostic of duodenal ulcer. In addition to finding it in gastric diseases associated with hyperacidity, he has found it to be a prominent symptom in abdominal arteriosclerosis. Especially when the patients so affected are doing badly do they experience "hunger pain" associated with a feeling of weakness, both disappearing when food is taken.

Rankin³ takes issue with Moynihan on the basis of his claim that the diagnosis of gastric ulcer can be made on the history and symptoms alone, and that physical examination is of no value. He believes that tenderness upon pressure just below the margin of the ribs to the right of the median line is a sign of great importance and that without it and rigidity of the right rectus muscle upon deep palpation the diagnosis of duodenal ulcer is doubtful. He cites several cases to illustrate his point.

Rankin refers to the positive Cammidge reaction in duodenal ulcer and quotes an unnamed distinguished physician as saying that "the pancreatic Cammidge reaction has been found in all my cases of duodenal ulcer demonstrated at the operation in which it has been looked for, and in the majority of those in which a duodenal ulcer was inferred from the symptoms," and an unnamed equally distinguished surgeon as stating that the pancreatic test "is common both to duodenal ulcer and to cholelithiasis, both of which are associated with duodenal catarrh." I fail to appreciate the process of reasoning that can attach any significance in the diagnosis of duodenal ulcer or duodenal catarrh to a reaction supposedly indicative of pancreatic disease. Rankin suggests that some of the symptoms now attributed to duodenal ulcer may be a result of pancreatic insufficiency. This, to my mind, is only a far-fetched attempt to justify the Cammidge reaction.

Günzburg also attaches importance to the physical examination

¹ British Medical Journal, 1909, No. 13, p. 648.

² Deutsche med. Wochenschrift, 1910, No. 28, p. 1318.

³ British Medical Journal, 1910, No. 2586, p. 181.

in the diagnosis of duodenal ulcer, and presents a new sign which he has frequently found to be of value. This consists in the presence of a tympanitic zone in the region corresponding to the quadrate lobe of the liver. According to its sponsor, the symptom is due to gaseous distention of the duodenum which lies just under the quadrate lobe of the liver.

HEMORRHAGE IN DUODENAL ULCER. Two conditions, more or less frequently associated with duodenal ulcer, require special discussion in considering the views held by Moynihan. These are hemorrhage and gastric dilatation. Of hemorrhage, Moynihan has the following to say:

"A sign which sometimes appears early in the course of this disease, but which is more often a late symptom, is hemorrhage. It is, of course, an evidence that the process of ulceration has extended to such a depth as to open up a large vessel, and so deep an invasion of the coats of the bowel is usually accomplished only after the lapse of months or of years. When bleeding occurs in quantity sufficient for it to be recognized as hematemesis, it is evidence of the deep penetration of the walls of the duodenum by an ulcer whose existence should have been recognized long before. Neither hematemesis nor melena should be considered as among the usual signs of duodenal ulcer; they are both complications whose onset should have been forestalled; they are a witness to neglected opportunities.

"The frequency with which bleeding occurs from a duodenal ulcer has been variously estimated by different authorities. Thus, Kraus, in the 70 cases collected by him, found that in 20 free hemorrhage had been observed. Oppenheimer, in 'over 100' cases, found bleeding recorded in 34. In Perry and Shaw's series of 60 cases presenting symptoms in a total of 151 cases, hematemesis or melena was present in 23; 9 patients had hematemesis, 9 had melena, and 5 had both hematemesis and melena. In Nothnagel's *Encyclopedia* (p. 245) it is said that 'severe hemorrhage occurs in about one-third of the cases.' Fenwick estimates the frequency of hemorrhage in acute cases at 26 per cent., and in chronic cases at 40 per cent.

"All these figures seem to me to be valueless. They are compiled from statistics in which every item is open to disproof or doubt. The symptoms which characterize duodenal ulcer so unmistakably were unknown to every one of these authorities; the frequency of the disease was, therefore, quite unappreciated. Only patients who suffered from such complications as stenosis, perforation, or hemorrhage were known to suffer from an ulcer in the duodenum, and the verification of the diagnosis could only then be made upon the postmortem table. In my own series of cases, hemorrhage has been noticed in over 30 per cent.

"But with the new light which now has been shed upon this important

subject by the work of the surgeon, we have come to recognize that hemorrhage is not a symptom but a late complication, that its onset is not to be awaited in order that a doubtful diagnosis may receive confirmation, but that its appearance is to be prevented by a timely recognition of the significance of the early symptoms. Hemorrhage, when it does occur, may be manifest either as hematemesis or as melena; the blood may be discharged in the vomit or in the feces. Melena may, and indeed usually does, exist without hematemesis, but when blood is vomited there is almost without exception some blood in the stools.

"I believe hemorrhage from a duodenal ulcer to be a sign of grave significance, of far more serious import than bleeding from a gastric ulcer. In the latter, death very rarely occurs; in the former, it is more frequent than is generally supposed. I have thrice had the experience of advising operation for duodenal ulcer in cases in which hemorrhage subsequently occurred and proved fatal before surgical help could be given. Hemorrhage from a gastric ulcer is sometimes very copious and gives rise to great alarm, but, when the bleeding ceases spontaneously, the patient recovers quickly. In duodenal ulcer the bleeding causes faintness and anemia, the exact origin of which may not be obvious until the bowels are moved. The faintness and prostration come again and again, an abundance of blood, at first black, but later of a brighter hue, is passed and the patient will rapidly become exsanguine and die.

"The manner in which hemorrhage appears varies much in different cases. As a rule, there is a considerable exacerbation in the symptoms before the bleeding, the 'indigestion' is more acute, the feeling of distention or oppression after food is greater, and the patient does not feel so well. Then suddenly he feels weak, faint, and breathless, the head feels light and swimming, and the sight quickly seems to grow dim. The patient looks white, the lips are bloodless, and sweat covers the brow; he asks constantly for air and is breathless; he displays, in brief, all the classical signs of an internal hemorrhage. That this has occurred is presently made certain by the voiding of blood in the characteristic 'tarry' motion, or by the ejection of brighter blood in the vomit. In other cases, the hemorrhage may occur insidiously, without the patient having noticed it; he is aware only of a continuing weakness and frailty which he can hardly understand. . . .

"It is probable that a certain degree of hemorrhage occurs in many cases of duodenal ulcer without being recognized. The surface of the ulcer, when fretted, probably bleeds a little, and if the stools were carefully and regularly examined, traces of occult blood would surely be found. I have, in a few cases, found this to be the case, but since I have realized how accurately the existence of an ulcer can be recognized from a study of the clinical symptoms alone, I have not pursued this

line of investigation closely. Occult blood, blood that is in quantities too small to be seen by the naked eye but capable of recognition by other tests, is therefore probably not very infrequent.

"The vessels which are opened by the deep invasion of the wall of the bowel by the ulcer vary considerably in size; in proportion to their size, the hemorrhage is slight or abundant. The following are some of the larger vessels which have been eroded, with the result that fatal hemorrhage has occurred. The aorta, the hepatic, gastroduodenal, superior pancreaticoduodenal, right gastro-epiploic, and pyloric arteries; the portal and superior mesenteric veins. In a few cases hemorrhage has been so sudden in onset and so profuse as to cause death which was almost sudden."

Though most writers agree with Moynihan in regard to his supposition as to the frequency of occult bleeding, few of them, if any, find other symptoms so sufficient for the diagnosis as to ignore it entirely. Ewald, as already noted, considers it a finding of definite importance in differentiating gastric and duodenal ulcer from conditions in the upper abdomen with which it might be confounded. Einhorn¹ also considers the recognition of bleeding from the ulcer as of great diagnostic importance, and believes that it can frequently be recognized by the use of his thread test. By means of this test, thread which has been swallowed is colored at different distances from the incisor teeth by the substances with which it comes in contact; if a duodenal ulcer exists, the thread is supposed to be colored a brownish red, from the presence of blood, about 58 to 66 cm. from the incisor teeth. Einhorn gives the history of six cases in which the thread test was of importance in establishing a diagnosis of duodenal ulcer. Ewald's² experience with the thread test does not coincide with Einhorn's. He was unable to find a discoloration suggestive of either bile or blood in the cases of duodenal ulcer in which he used the test, and believes that on account of reflex spasm of the pylorus, the little bucket attached to the end of the thread does not even enter the duodenum in cases of ulcer of that organ.

Moreover, most authorities do not yet look upon frank hemorrhage, either vomited or in the stools, as a late complication of duodenal ulcer as does Moynihan. Wilms³ looked upon intestinal hemorrhage in the absence of gastric symptoms as the most characteristic symptom in two of his cases. However it may be, as claimed by Moynihan, only the ignorance of most physicians of the diagnostic features of early duodenal ulcer that prompts them to look upon frank hemorrhage as a symptom rather than a late complication.

GASTRIC DILATATION IN DUODENAL ULCER. In regard to gastric dilatation in duodenal ulcer, Moynihan says: "In a rather later stage

¹ American Journal of the Medical Sciences, 1909, No. 449, p. 162.

² Loc. cit.

³ Münchener med. Wochenschrift, 1910, No. 13, p. 673.

dilatation of the stomach, with motor incompetence, may appear. That is to say, the stomach is unable to empty itself completely within the normal period of time. What would be considered a 'normal period' is not agreed upon by all writers. I have arbitrarily adopted the period of twelve hours. If a stomach is not able to empty its contents into the duodenum within twelve hours, it is very probable that there is organic disease which prevents it doing so. Gastric stasis, then, may be found in cases of duodenal ulcer; it is due always to the narrowing which occurs by reason of the healing, partial, as a rule, but sometimes complete, of the ulcer or ulcers. I have never found that stasis of this degree was present as a result of pyloric spasm. It is possible that a spasm of the pylorus prevents the stomach from emptying as quickly as it otherwise would do, for the spasm no doubt exists because of the need for protection of the ulcer of the duodenum from the harm which contact with the acid chyme would inflict. The spasm is reflex and is protective, as was so beautifully shown by Cannon and Murphy.¹ But a spasmodic contraction of the muscle which guards the outlet does not prevent the stomach from emptying within the period of twelve hours. Its occurrence is probably protective also in the fact that it arouses symptoms, the mere presence of which makes the patient less eager to take food in full quantities. Gastric stasis denotes, therefore, the existence of a narrowing in the duodenum due to organic disease. When this narrowing attains even a very moderate degree, a hypertrophy of the musculature of the stomach develops, as always happens in the alimentary canal, and the evidence of this may be found in the visible peristaltic waves when the stomach is examined. If the stomach is empty or only partially filled, these muscular contractions may not be seen, but the administration of the two halves of a Seidlitz powder separately will soon excite them. (I should hardly recommend this as a safe or sane procedure in a case in which ulceration in either the stomach or duodenum was suspected.—L.)

If gastric dilatation in association with duodenal ulcer is only a result of cicatrization of the ulcer and never of pyloric spasm, we must agree with Moynihan in looking upon it as a late complication. However, many observers hold that it may result from repeated spasms of the pylorus. Einhorn² so expresses himself, and Günzburg thinks that the inability of the stomach to completely empty itself in seven hours is a sign of some importance in the diagnosis of duodenal ulcer, even though it may indicate a beginning stenosis rather than repeated pyloric spasm.

FREQUENCY OF DUODENAL ULCER. The German clinicians and surgeons apparently find it difficult to unconditionally accept the figures of English and American surgeons, especially Moynihan and the Mayos,

¹ *Annals of Surgery*, 1906, vol. xliii, p. 512.

² *Loc. cit.*

as to the frequency with which they have met duodenal ulcer, and the relative frequency of gastric and duodenal ulcer. Between 1900 and 1909, Moynihan operated upon 228 patients for non-perforated duodenal ulcer and in the last few years the Mayos have operated upon 113 cases of duodenal ulcer, in 15 of which gastric ulcer was also found. Mitchell reports having operated upon 50 cases during the period of eighteen months. It is not to be wondered that such figures appear startling when we consider the experience of such prominent continental surgeons as Wilms, who, in his surgical clinic, operated upon but 8 cases of duodenal ulcer in a period of three years. It must, however, be considered that the English and American surgeons whose statistics have been quoted have established such reputations in the diagnosis and surgical treatment of diseases of the upper abdomen that patients are sent to them in large numbers and from great distances. Moreover, they have become so expert in the diagnosis of the conditions for which they operate that they probably diagnosticate these more frequently than do others. However, both Wilms and Ewald believe that duodenal ulcer must be more frequent in America and England than in Germany.

RELATIVE FREQUENCY OF GASTRIC AND DUODENAL ULCER. The statistics of Moynihan and the Mayos concerning the relative frequency of gastric and duodenal ulcer are also the objects of much remark by the German investigators. The relative frequency of gastric and duodenal ulcer is given by Tiers as 9 to 1, by Burwinkel as 12 to 1, and by Andral as 40 to 1. Ewald states that, according to postmortem statistics, even 40 to 1 is too high for the frequency of duodenal ulcer as compared with gastric ulcer. But the statistics of Moynihan place the relative frequency at about 3 to 2 and those of the Mayo brothers even 2 to 3. In connection with these statistics, however, it must be recalled, as stated by Ewald, that the surgeons see the cases of gastric and duodenal ulcer which do not respond to medical treatment, and as duodenal ulcer is much more difficult to cure by medical means than gastric ulcer, many more cases of the former than the latter condition would come into the surgeons' hands.

zum Busch,¹ the surgical chief of the German Hospital in London, undertakes to defend Moynihan from the suspicions of the German clinicians and surgeons, and at the same time gives the records of nineteen cases of duodenal ulcer on which he had operated, using the same diagnostic criteria as does Moynihan, and following the same method of treatment.

TREATMENT. When we come to consider the question of treatment of duodenal ulcer we find a certain amount of antagonism manifested in the attitude of surgeons and physicians. Most of the surgeons agree that medical treatment should be used in early or acute cases,

¹ *Münchener med. Wochenschrift*, 1910, No. 28, p. 1481.

and most physicians advise surgical measures in the chronic or stubborn cases. The question is as to what constitutes an early case, and what constitutes a late case. Moynihan advises operation in all cases in which there have been repeated attacks, or in which hemorrhage has occurred, or in which there are signs of gastromotor insufficiency, whereas most physicians recommend that cases presenting these features be first given a thorough trial on medical treatment.

Hort,¹ in an article indorsing medical treatment in chronic duodenal ulcer, says that before counselling our patients to undergo surgical treatment we should inquire:

"1. If the eventual results of operation, especially of the posterior no-loop variety, are as uniformly good as the immediate issues sometimes appear to show.

"2. If we yet know sufficient of the essential nature of the disease itself to justify us in making *ex cathedra* statements as to what, in these cases, is the correct treatment to adopt.

"3. If it is really true that medical science can do little to avert the necessity for what must always, even granting a low operative mortality, be a somewhat formidable procedure."

He answers these questions as follows:

"1. With regard to the first of these inquiries, it happens that in the last few months there have been sent to me five cases of duodenal ulcer which have been submitted to operation. In each case the surgeon was a man of high reputation in connection with recent developments in gastric and duodenal surgery, so there can be no question of the degree of surgical skill involved. Very briefly these are the results:

"The first patient, operated upon twenty months ago, says: 'Since the operation I have had no real peace or relief. My general health is perhaps improved, but I have the old pain always.'

"The second, operated upon last winter, says he cannot believe the ulcer is really healed. He never had vomiting until after operation and then not for many weeks. He now has severe pain at the old site and at the point of junction.

"The third, operated upon eighteen months ago, is in a lamentable condition, with frequent attacks of severe pain, sometimes melena, and constant distress from an aggravated form of flatulent dyspepsia.

"The fourth had an alarming attack of melena several months after operation, and intermittent pain in the left subcostal area.

"The fifth, operated upon nearly two years ago, had recurrence lately of pain and hemorrhage, and, in addition, uncontrollable retching and sometimes vomiting when the hand is laid even gently upon the abdominal wall.

"I have, in addition, notes of three gastric cases short-circuited for ulcer, presenting a similar history.

¹ British Medical Journal, 1910, No. 2558, p. 76.

"In these cases, and in the gastric ones, ulceration has apparently persisted or recurred; in most, there is the additional distress caused by the profound disturbance in the mechanics and hydrostatics of stomach and bowel caused by the new connection. Viewed from any standpoint, the postoperative condition now is a most difficult one to deal with, as I find all treatment practically useless, beyond temporary relief of the associated catarrh, so much so that I now decline to undertake the treatment of such cases.

"It would, of course, be most unfair to quote a few isolated cases of failure of relief by operation, and from them to belittle the brilliant work of Mr. Moynihan, the Mayo brothers, and their colleagues. But it is most unlikely that mine has been a solitary experience, and the question arises if operation may sometimes perhaps be undertaken unduly early as well as unduly late. However this may be, an impression remains that a considerable time should elapse after operation before one can judge of the likelihood of permanence of results."

2. In answer to the second question, Hort inclines to the belief that a duodenal ulcer is in all probability but the expression of a constitutional disease of which the ulcer is only a local manifestation. The facts which prompt him to so believing are expressed as follows:

"Ulcer of the duodenum is very often a multiple lesion; it is frequently associated with a similar lesion on the other side of the pyloric gate; it is, as I have often had occasion to note, often associated with ulcers, sometimes of great depth and extent, in the tongue, gums, or cheeks; it is not by any means unknown in association with ulceration of the esophagus; it has an inveterate tendency to recur, often through a long series of years, and, finally, there is hardly any toxemic condition in which it may not occur as a purely symptomatic event."

Furthermore, according to Hort, the frequency of recurrence and the fact that manifestations of activity are frequently excited by changes in season, impairment of the patient's general health, worry, and anxiety, both tend to substantiate the view that gastric or duodenal ulcer is a dyscrasia of which the changes in the stomach or duodenum are but focal manifestations. If this is true, surgical intervention is not in place, and, according to Hort, is no more rational than to suppose that "by amputating a foot with a perforating ulcer one could eliminate the spirocheta, restore the integrity of trophic neurons, and prevent recurrence of ulcer in the opposite limb."

3. Concerning this question, Hort believes that many cases of duodenal ulcer under appropriate treatment recover, and recover completely. The treatment which Hort has found to be most satisfactory during recent years is as follows:

For acute cases, with hemorrhage, subcutaneous injections of sterile normal horse serum and feeding by the mouth at the very earliest opportunity with small, dry meals, mainly of meat.

For chronic cases, full meat diet in an appropriate form from the start, with repeated oral doses—never on an empty stomach—of an antilytic serum specially prepared.

The rationale of this treatment Hort outlines as follows:

"1. If it be true that duodenal ulcer is a symptom and not a disease, the absorption of adequate protein in suitable form cannot but increase the resistant powers of the body as a whole to the unknown determining cause of the disease. Moreover, local repair must certainly be assisted thereby.

"2. If protein food is presented to a case of ulcer in which we know that the digestive fluids exhibit a high degree of peptic and tryptic avidity, a certain proportion of these peptic and tryptic molecules will be saturated by the protein. If now, at the height of digestion, be added a serum with a high antipepsin and antitrypsin content, some of the unsatisfied residue of peptic and tryptic bodies will combine therewith, and the ulcer itself thus be indirectly shielded by diversion of these bodies.

"3. Once more, if an ulcer is constantly being bathed in secretions laden with trypsin and other proteolytic ferments set free from disintegrated leukocytes, other tissue cells, and from bacteria, the administration of a serum charged with antipeptic, antitryptic, and other inhibitory bodies, cannot but have great value. That is to say, the eroding activity of ferments from these sources must, to a great extent, be kept in check by such serum. That this is not a matter of theory only can be proved by anyone who cares to treat a superficial ulcer which is constantly being bathed in highly tryptic pus, by the simple expedient of dressing it with sterile gauze soaked in sterile normal serum."

Hort adds that "whatever the rationale of this treatment, the clinical results are undeniable, and though at first it met with quite legitimate skepticism, doubt is rapidly giving place to inquiry, inquiry to trial, and trial to conviction."

Excepting for this special plan of treatment recommended by Hort, duodenal ulcer is treated, dietetically and medicinally, quite the same as gastric ulcer.

The statistics of Moynihan reported by zum Busch¹ give a somewhat different aspect to the question of operative treatment of duodenal ulcer than is gained from Hort's statements. Between the years 1900 and 1909, Moynihan operated upon 228 patients for chronic duodenal ulcer, with but four deaths. In the last 116 cases he has had no deaths. Of the patients on whom he operated and whose condition could be determined at least a year after operation, 147 are well and entirely free from symptoms, 18 improved, 2 not improved, and 11 dead. Such

¹ Loc. cit.

results in a condition as serious as duodenal ulcer, and after an operation as pretentious as that demanded, are, to say the least, most gratifying. An important feature in the argument in favor of operation in chronic non-perforated duodenal ulcer is the seriousness of hemorrhage and perforation when either of these accidents occurs. The mortality from both of them, even when appropriate therapeutic measures are instituted, is considerably greater than the mortality resulting from the same accidents in gastric ulcer.

According to Moynihan, the operations which may be performed for non-perforating duodenal ulcer are: (1) Excision of the ulcer and restoration of the duodenal canal; (2) excision of a cylinder of the duodenum by closure of the distal end and union of the pyloric cut end with the side of the second portion of the duodenum; (3) partial resection of the duodenum, followed by closure of both cut ends, and gastro-enterostomy, and (4) gastro-enterostomy.

Moynihan finds that as the cases come to the surgeon, it is almost always necessary to perform gastro-enterostomy. In addition he invariably infolds the ulcer, a measure strongly advocated by Wilms. This procedure narrows the lumen of the duodenum so that the stomach contents must pass out by way of the newly formed opening and thus permits a more ready healing of the ulcer.

Duodenal Bucket. Barth-Wehrenalp¹ concludes, from his clinical use of the Einhorn duodenal bucket, that in the majority of cases the bucket arrives in the duodenum, and that, in cases of duodenal ulcer, the string may become blood stained, but this depends to a great extent upon its coming, by chance, in contact with the ulcerated area. It is furthermore possible, by this procedure, to obtain duodenal contents; consequently in those cases in which diastatic ferments can be demonstrated in the contents of the bucket the deduction is justified that pancreatic secretion is intact; no conclusions, however, can be drawn from a negative result unless it can be proved by means of the Röntgen rays that the bucket was in the duodenum. Ewald's results with the use of the duodenal bucket in duodenal ulcer were mentioned above.

Catheterization of Duodenum. As an aid to the diagnosis of gastrointestinal disease, Einhorn² proposes a new method of catheterizing the pylorus and duodenum. His method consists in first permitting the patient to swallow his duodenal bucket, and when this has arrived in the duodenum to thread over the string to which it is attached a specially constructed catheter. Attached to the proximal end of this catheter is a small syringe permitting the duodenal contents to be drawn up into the catheter. Another form of catheter which he has devised has a small rubber ball on the lower end which can be blown up after

¹ Internat. Beitr. z. Path. u. Therap. d. Ernährungsstörungen, 1910, Bd. i, Hft. 4, p. 530.

² Archiv für Verdauungskrankheiten, 1909, Bd. xv, Hft. 6, p. 727.

the catheter has been introduced and the size of the pyloric opening thus determined.

Finding the use of this instrument somewhat difficult, and finding it possible to introduce it only as far as the first portion of the duodenum, Einhorn¹ later devised an instrument consisting of a soft-rubber tube with a small metal bulb on the end. The method of introducing this instrument is as follows: The bulb and adjacent portions of the tube are placed in warm water for a short time; the bulb is then placed in the patient's pharynx and the patient is given a glass of water to drink; the bulb is thus introduced into the stomach and the patient is allowed to rest for an hour, at the end of which time it is usually found that the peristalsis of the stomach has moved the bulb past the pylorus into the duodenum. A small syringe is attached to the proximal end of the tube and by its means duodenal contents can be removed. The tests which Einhorn usually applies to this fluid are for the presence of bile, steapsin, trypsin, and amyllopsin.

A similar instrument to this latter one of Einhorn's is that described by Gross,² which, according to his statements, he devised in 1894.

Appendicitis. ETIOLOGY. There continues to be as much discussion and as much hypothesis concerning the etiology of appendicitis as ever. Brünn³ concludes from his pathological studies that alterations in the blood supply of the appendix play the most important role in the inflammations to which the organ is subjected. Liertz,⁴ on the other hand, concludes from his radiographic studies that anomalies in the position of the appendix are of the first importance. Mac Lean⁵ contends that the eating of meat is the all-important factor in appendicitis, but presents very little evidence of a convincing nature to support his contention.

EPIDEMIC OF APPENDICITIS. Hasse⁶ contributes a short note on a very interesting epidemic of appendicitis occurring in an institution in Oberginingen. Between the middle of January and the middle of March, 30 cases occurred, 25 of which were operated upon. In almost all of the cases, the patients complained of sore throat before the outbreak of the symptoms of appendicitis. Occurrences of this nature tend strongly to convince one of the epidemic nature of appendicitis, yet we must agree with Brünn that we are not justified in speaking of the epidemic nature of the disease until a single organism has been shown to be the cause of the disease. Both he and Liertz believe that organisms play a very subordinate role in the etiology of appendicitis.

TRAUMA IN APPENDICITIS. The importance of trauma in the causation of appendicitis has been variously estimated. In the early nineties,

¹ Berliner klinische Wochenschrift, 1910, No. 12, p. 522.

² Münchener med. Wochenschrift, 1910, No. 22, p. 1177.

³ Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1909, Bd. xxi, Hft. 1.

⁴ Deutsche med. Wochenschrift, 1910, No. 27, p. 1269.

⁵ Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1909, Bd. xxi, Hft. 1.

⁶ Münchener med. Wochenschrift, 1910, No. 21, p. 1123.

Fitz estimated its frequency as a cause of appendicitis at 7.3 per cent., and Hawkins at 8.4 per cent.; in 1900, Neumann estimated that 6.5 per cent. of all cases of appendicitis resulted from trauma, and at about the same time the reports of the Prussian army showed its frequency to be 5.6 per cent. Kröte and Borchard calculated that but 2 per cent., Sonnenburg, 1.5 per cent., and Nordmann, but 1.2 per cent. of their cases could be attributed to trauma. The differences in these statistics are in all probability attributable to the fact that in the earlier days of our knowledge of appendicitis only the severer cases were recognized, and consequently trauma was considered to be a much more important etiological factor than it now is. Tiegel,¹ writing on traumatic appendicitis, contends that only those cases should be included in the category of traumatic appendicitis in which a person, previously in perfect health, develops an appendicitis soon after trauma or in which a person who has suffered with chronic appendicitis but who is able to follow his daily occupation without discomfort, develops an acute attack of appendicitis immediately after trauma.

According to Tiegel, traumatic appendicitis is characterized by the severe course which it runs, by the extraordinary high mortality with which it is attended, and by the frequency with which fecal concretions are found in the appendix. Brüning, in a study of 34 cases of traumatic appendicitis, found a mortality of 55.8 per cent. Combining the statistics of Brüning, Vogel, and his own, Tiegel estimates a mortality of 47.6 per cent. Tiegel found fecal concretions in the appendix in 42.9 per cent. of his cases, Neumann in 90 per cent., and Brüning in 75.8 per cent. of his cases. In acute appendicitis in general, fecal concretions, according to Sprengel, occur in but 47.6 per cent. of the cases.

PHYSICAL EXAMINATION OF APPENDIX. Orłowski² contributes rather an exhaustive discussion of the palpability of the normal appendix and of the interpretation of the results of the physical examination in appendicitis. He concludes that pain and tenderness in the various points that have been described in the region of the appendix are not of great diagnostic value, and that no great reliance can be placed even upon tenderness of the appendix itself. Only an exhaustive analysis of the history, with detailed attention to all of the features of the case, taken in conjunction with the occurrence of pain and tenderness in the region of the appendix, will in each individual case lead to a proper diagnosis.

PAIN IN APPENDICITIS. Blumberg³ again discusses a sign in appendicitis to which he called attention several years ago. Strictly speaking, the sign is rather of an early peritonitis in connection with appen-

¹ Münchener med. Wochenschrift, 1909, No. 46, p. 2369.

² Zeitschr. f. klin. Med., 1910, Bd. lxx, Hft. 1 and 2, p. 35.

³ Berliner klinische Wochenschrift, 1910, No. 4, p. 139.

dicitis than of appendicitis itself. It consists in the determination of the amount of pain the patient experiences when there is sudden release of pressure exerted in the region of the appendix. The author considers the occurrence of pain as a result of this manipulation to be diagnostic of peritoneal inflammation and looks upon its significance as entirely different from that produced by the pressure itself. The pain produced upon pressure is dependent purely upon the inflammation within the appendix, that produced by the sudden release of pressure is due to the beginning peritonitis attending the appendiceal inflammation. The author states that it can be used as an early sign of peritonitis in other conditions as well, but that he has found it especially serviceable in appendicitis. When the pain produced by the release of pressure is greater than that produced by the pressure itself, the indications are for radical treatment.

LEFT-SIDED APPENDICITIS. Karewski¹ calls attention to the necessity of keeping in mind, in abdominal diagnosis, the occurrence of left-sided appendicitis. According to him, left-sided appendicitis may occur under four conditions: (1) In complete *situs inversus*; (2) in those rare instances in which the cecum alone lies on the left side; (3) in those cases, occurring almost exclusively in children, in which the appendix is long enough to extend from the right iliac fossa across the pelvis into the left iliac fossa, and (4) in those cases in which, as a result of a former appendicitis or other peritoneal inflammatory condition, the appendix is drawn by adhesions into the left iliac fossa. Karewski quotes instances of these different types of left-sided appendicitis, and calls attention to the necessity of care in the differential diagnosis between it, acute diverticulitis, and inflammations of the pelvic organs.

ICTERUS IN APPENDICITIS. Holländer² believes that icterus occurring in the early stages of an acute appendicitis is indicative of a beginning or advanced necrosis of the appendix. He looks upon it purely as a toxic manifestation which rapidly disappears after removal of the appendix. Koelsch³ records a subphrenic abscess occurring as a result of appendicitis, and Rosenkranz⁴ calls attention to the occasional association of pyelitis and appendicitis.

TREATMENT. Kümmell⁵ analyzes a large series of cases of appendicitis and draws conclusions from which the following are extracted:

According to the pathologists, about four-fifths of all persons at one time or another have appendicitis. The more or less severe pathological changes which are found at autopsy cannot be interpreted as complete cures, but as disease manifestations which are latent, but

¹ Berliner klinische Wochenschrift, 1910, No. 5, p. 194.

² Ibid., No. 22, p. 1011.

³ Münchener med. Wochenschrift, 1909, No. 40, p. 2056.

⁴ Berliner klinische Wochenschrift, 1910, No. 16, p. 723.

⁵ Deutsche med. Wochenschrift, 1910, Nos. 25, 26, and 27.

which can easily develop into an acute attack. Thus are explained the advanced changes which surgeons frequently find when they operate a few hours after the beginning of what appears to be an acute attack.

According to Kümmell, there is no symptom or sign which permits of a positive diagnosis of appendicitis, or of any reliable degree of prognosis. Consequently the only means we possess of being relatively sure of the outcome of the disease lies in the early removal of the organ as soon as the diagnosis is established. He emphasizes that the early operation is attended with little danger and his own statistics show a mortality of but 0.6 per cent. in cases operated upon within forty-eight hours after the onset.

Not all cases of appendicitis, however, demand operation; there is a considerable group of cases in which the symptoms are so mild that the attack lasts but a few hours. These do not demand operation; if, however, symptoms last for more than twelve or, at most, twenty-four hours, they come within the group of cases in which operation should be performed.

According to Kümmell, appendicitis is a disease characterized by recurrences. Recurrence is the rule, and freedom from attacks after the occurrence of one attack is the exception, as is also spontaneous healing. What is termed healing by medical means is nothing more than temporary freedom from attacks. Excepting after removal of the appendix healing can be spoken of only after years of freedom from attacks. Medicine treats appendicitis, surgery cures it. Healing is possible only by the removal of the appendix, and the earlier the operation is undertaken the safer and surer is the cure.

Buck¹ records himself as favoring early operation in appendicitis, and Bauer² contends that the only means by which we can substantially decrease the mortality from acute appendicitis is by teaching the people the symptoms of appendicitis, by having a physician called as soon as symptoms suggestive of appendicitis present themselves, and by having such patients, if the physician confirms the diagnosis, sent immediately to the surgical department of a hospital where, unless there is decided contra-indication to the operation or the patient will not permit it, operation should at once be performed.

Cancer of Appendix. During the latter years carcinoma of the appendix has apparently been observed with increasing frequency. Recently, however, several observers have claimed that the condition which has been called carcinoma is in reality not carcinoma. Prominent among these is Milner.³ In a recent article he discusses the nature of these so-called carcinomas. One of their remarkable characteristics is their occurrence with unusual frequency at a much younger age than other

¹ *Lancet*, 1910, No. 4531, p. 24.

² *Berliner klinische Wochenschrift*, 1910, No. 2, p. 45.

³ *Deutsche med. Wochenschrift*, 1910, No. 25, p. 1190.

carcinomas occur. They are usually multiple, varying in size from that of a pinhead to that of a bean. Histologically, they are sharply circumscribed in the direction of the mucosa and submucosa, whereas they diffusely infiltrate the muscularis and subserosa. They seldom show a glandular structure; the cells are relatively small, of uniform size, and seldom show mitosis; the stroma is remarkably delicate and regular, and seldom shows any reactive proliferation. Macroscopically, these tumors have a yellowish-white, homogeneous appearance suggestive of tuberculous caseation.

It is Milner's claim that these tumors are not carcinoma but products of a chronic hyperplastic inflammation, principally a hyperplastic lymphangitis. He bases this claim upon the histological characteristics of the tumor, upon the frequency of their occurrence in the young, and upon their evident benignity in spite of the tendency to diffuse infiltration of the muscularis and the subserosa.

Dietrich¹ does not agree with Milner, but contends that the tumors constitute a unique form of carcinoma of the simple variety. He admits that chronic inflammation may be a factor in their production, but that neither this nor their apparent benignity, nor their tendency to occur in the young, constitute sufficient grounds for denying their carcinomatous nature.

Wagner² reports a rather unusual case of metastasis of a carcinoma of the breast to the appendix.

Brunton and Glover³ report an interesting case of inoperable carcinoma of the appendix treated with injections of water which had been exposed for some days to emanations of radium. The measure proved remarkably successful, considering the patient's condition when its use was commenced, and enabled him to live eight years from the time when the carcinoma was first recognized.

Diverticula of Appendix. Acquired appendix diverticula, according to Konjetzny,⁴ may be non-inflammatory or inflammatory. The non-inflammatory diverticula are similar to the diverticula in the colon and sigmoid; they are partial extrusions of the mucous membrane through the vascular spaces in the muscularis. The existence of non-inflammatory diverticula of the appendix has been denied by some observers, but Konjetzny presents several cases which can scarcely be interpreted in any other way than as non-inflammatory diverticula. Inflammatory diverticula as the term indicates are extrusions of some portion of the appendicular wall resulting from the inflammatory destruction of other portions of the wall, associated with the increased internal pressure due to the inflammatory exudate within the lumen of the

¹ Deutsche med. Wochenschrift, 1910, No. 13, p. 610.

² Wiener klinische Wochenschrift, 1910, No. 13, p. 472.

³ Lancet, 1910, No. 4511, p. 419.

⁴ Münchener med. Wochenschrift, 1909, No. 44, p. 2251.

appendix. According to Konjetzny, inflammatory diverticula are of great frequency, and if careful search is made for them they will be found in almost all cases of acute appendicitis in some stage of their development.

Ileocecal Hyperplastic Tuberculosis, which was discussed in *PROGRESSIVE MEDICINE* for 1908, is considered in a very comprehensive article by Cumston,¹ who, however, contributes nothing new to the subject.

Peristalsis of Colon. An extremely important contribution to the physiology of the colon is that of Holzknecht.² As a result of his radiographic studies, he concludes that the peristalsis of the colon occupies but a few seconds out of the twenty-four hours. In the remaining time the colon is at rest. The haustral constrictions, which can be observed a few centimeters from each other throughout the course of the colon, merely constitute a mechanism to insure all of the contents coming thoroughly in contact with the mucous membrane of the colon. These, however, are not concerned with the propulsion of the contents toward the rectum. This latter occupies but three or four seconds and occurs about three or four times in the twenty-four hours at intervals of about eight hours. By this means the entire contents of the ascending or transverse portions of the colon may be suddenly moved into the transverse or descending colon, and subsequently into the rectum. If Holzknecht's observations are correct they will compel us to radically change our conceptions of the peristalsis of the colon and will probably alter our views concerning diseases of the colon, especially those concerned with its motility, chronic constipation in particular.

Constipation. Diagnosis. In the diagnosis and treatment of constipation, Herschell³ claims that it is very necessary to determine the time taken by the food to traverse the gastro-intestinal canal. He says:

"This may be estimated either by following the shadow of a bismuth meal upon the radiographic screen or by administering a dose of some inert coloring matter, such as carmine or vegetable charcoal, and observing when it appears in the stools. The radiographic method is unfortunately only at the disposal of those medical men who, living in large centres, have access to a properly equipped radiographic laboratory, and to those patients to whom the question of expense is not important; or to the fewer number who have an installation in their house and the technical knowledge to use it efficiently. The charcoal or carmine capsule, besides being of universal application, will often reveal much more than the Röntgen rays, and must eventually be used in many cases.

"Surprisingly little study has been accorded by diagnosticians in this country to the actual time taken by the food to pass through the

¹ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 7, p. 204.

² Münchener med. Wochenschrift, 1909, No. 47, p. 2401.

³ Lancet, 1910, No. 4525, p. 1401.

alimentary canal, considering that its clinical importance is just as great as the daily number of stools. For instance, it is not at all unusual for a patient to have one stool a day and in consequence consider the bowels to be regular, while all the time there is a latent constipation with retention of fecal matter, giving rise to chronic ill-health from auto-intoxication.

“(a) In cases of diarrhea, the passage of the charcoal in the normal time would tend to show that the peristalsis in the small intestine was not increased, and that the disturbance was in the lower portion of the large intestine.

“(b) In diarrhea, the quick appearance of the charcoal or carmine in the stools would suggest that the trouble was in the small intestine or ascending colon.

“(c) In a patient who has daily motions, a dose of charcoal given at breakfast should appear in the next morning's stool. If it fails to do so, there is latent constipation. If, after the stool, lavage of the sigmoid brings away black feces, there is retention in the lower bowel. If it does not do so, the delay is in the cecum, ascending, or transverse colon.

“(d) In a patient who does not have a daily motion, the removal of black feces by lavage of the sigmoid on the morning following the administration of the cachet would show that atony or dilatation of the lower bowel was an important factor in the production of constipation.

“(e) Appearance of black stools for several days after the administration of a dose of charcoal will point to atony of the bowel and latent constipation.

“(f) By administering a dose of charcoal or carmine at the commencement of an intestinal test diet, we are able to mark off the moment when it commences to appear in the stools, and when we may safely use them for purposes of examination.

“(g) We may mark off and obtain the total feces corresponding to a test diet extending over a fixed period by giving a carmine cachet at its commencement and termination (provided there is no latent constipation).”

SPASTIC CONSTIPATION. The contentions for and against the existence of spastic constipation continue as vehement as ever. Those who, with Fleiner, contend for its existence base their views upon three factors: (1) The character of the stools; (2) the occurrence of spasm of more or less extensive areas of the large intestine, and (3) the finding of a spastic contracted sphincter. Boas¹ claims that during recent years he has paid special attention to these three factors, but has been unable to convince himself of the existence of such a condition as spastic

¹ Archiv für Verdauungskrankheiten, 1910, Bd. xv, Hft. 6, p. 683.

constipation despite the fact that in numerous patients suffering with gastro-intestinal disorders he has not infrequently encountered colonic spasm.

Treatment. Tyrode,¹ detailing his treatment of constipation, states that in practically all cases he obtains much better success with the use of a *bland, non-irritating diet* than with one containing large amounts of waste material.

Gompertz² discusses the clinical features of chronic constipation, and emphasizes the success that has attended his use of *agar agar* in this condition, a remedy suggested to him by Professor Lafayette B. Mendel. This substance, with a small amount of cascara added to it, has been in use for some years and is on the market under the name of "*Regulin*."

It has been known for many years that *bile* possesses more or less laxative properties, and it is occasionally administered by mouth for its laxative effect. Recently, Glaessner and Singer,³ in conducting animal experiments, discovered that bile administered *per rectum* was much more efficient than administered in any other way. They determined that the biliary acids were the active elements in the bile producing these effects. Subsequently employing *chloric acid* in doses of from 0.1 to 0.3 gram in the form of suppositories they were able to observe the same action in patients with various types of constipation as they had observed in animals. The stools, usually very large in quantity, occurred in most cases five to ten minutes after installation of the suppository.

INTESTINAL BODY PAINS. Under the term of "Intestinal Body Pains," Ebstein⁴ describes the various types of neuralgic pain which he has met as a consequence of constipation. Frequent seats of these neuralgic pains are the various branches of the trigeminal nerve, especially its supra- and infra-orbital branches, and the occipitalis major nerve. There is usually tenderness to pressure over the course of these nerves. Other seats of the pain which he describes are the thorax, especially its lower portion, and the knee. According to Ebstein, these pains are infrequently recognized as intestinal in origin, but there is no better proof of their dependence upon constipation than the rapidity with which they disappear after correction of the intestinal derangement.

Nervous Diarrhea. In an analysis of the etiological features of nervous diarrhea, Bickel⁵ concludes that the condition is primarily dependent upon an excessive response on the part of the intestines to stimuli which, in a normal individual, produce a normal defecation. Based upon

¹ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 20, p. 670.

² American Journal of the Medical Sciences, 1909, No. 451, p. 538.

³ Wiener klinische Wochenschrift, 1910, No. 1, p. 5.

⁴ Münchener med. Wochenschrift, 1909, No. 47, p. 2406.

⁵ Berliner klinische Wochenschrift, 1910, No. 11, p. 475.

this assumption, rational treatment consists not in the administration of astringents, but in psychical measures and constitutional treatment tending to improve the patient's nervous tone and bodily vigor. The *psychical treatment* should consist essentially in convincing the patient of the anatomical integrity of his intestinal tract, and in detracting his attention from the intestines. The *constitutional treatment* consists in the application of general hydrotherapeutic measures, in the administration of tonics, and, not infrequently, in a change of climate. If the patient has been at or near sea level, the change of residence for a time to an altitude of about 3000 feet is frequently beneficial. Diet, which is not of great importance in treatment, should be regulated according to the individual taste and peculiarities.

Intestinal Spasm. The existence of a purely functional spasm of the intestines has been denied by many observers, and yet the reports of instances of this condition are becoming more and more frequent. Nordmann¹ reports 3 cases, 2 of them occurring in hysterical patients, 1 of them in a patient in whom no nervous or other affection could be determined as responsible for the condition. Two of these patients were operated upon; 1 recovered, the other died. Nordmann emphasizes the importance of determining any nervous affections which may be responsible for the condition. He recommends the use of atropine, but advises operation before it is too late in cases in which medical treatment does not seem to be of avail.

Rinne² reports two cases of a more chronic nature than those of Nordmann. Both of these patients were apparently cured by a simple laparotomy.

Chronic Primary Intussusception. According to Goodall,³ chronic primary intussusception in the adult is a condition which has not received the attention it deserves, and is probably more frequent than is generally recognized. He has collected 122 instances of the condition, 5 of which are reported for the first time. On the basis of these, Goodall presents a very complete and instructive analysis of the pathological and clinical features of the condition. The analysis of these cases shows the intussusception to have been ileocecal in 70.3 per cent.; enteric in 15.3 per cent.; colic in 13.5 per cent.; the variety was not mentioned in 11 cases, and in 1 there was intussusception of a Meckel's diverticulum.

The condition occurs most frequently between the ages of twenty and forty years, and it is about twice as common in males as in females. Symptomatically it is characterized by recurrent attacks of abdominal colic with symptoms of intestinal obstruction and the presence of an abdominal tumor which appears and disappears with the pain, or which is constantly present but changes its shape and position, or, in the absence

¹ Deutsche med. Wochenschrift, 1910, No. 10, p. 452.

² Archiv für Verdauungskrankheiten, 1909, Bd. xv, Hft. 5, p. 604.

³ Boston Medical and Surgical Journal, 1910, vol. clxii, Nos. 14 and 15.

of these two characteristics, corresponds in shape to the intestines; blood and mucus are frequently present in the stools; a rectal tumor is occasionally present and is of extreme diagnostic importance; progressive anemia and emaciation, with an afebrile course, complete the picture.

Treatment is essentially *surgical*. If medical treatment be employed it should be done with the greatest caution in order not to subject the patient to any irreparable damage.

Habitual Torsion of Mobile Cecum. In last year's article in *PROGRESSIVE MEDICINE*, Dr. Edsall mentioned Wilms' observations on the elongated cecum as the cause of a condition which was frequently looked upon as chronic appendicitis. Klose¹ describes a modification of this condition under the term of "Habitual Torsion of the Mobile Cecum." This condition is usually an accompaniment of the habitus enteroproticus, though it may occur in persons of normal habitus. It is characterized by intermittent attacks of colic with more or less continuous pain in the right groin. These attacks are either afebrile or subfebrile, and usually occur periodically, at first every month or so, later every week and, finally, once or more a day. The attacks are usually preceded by constipation and flatulence, and are usually succeeded by numerous offensive stools. The secondary adhesions of the cecum with the surrounding organs account for the continuous pains which in more or less severity are usually present. The individual attacks last from a quarter of an hour to two hours, and occasionally as long as a half-day. One of the most characteristic features of the condition, according to Klose, is a firm tumor about the size of a small apple in the region of the appendix. According to the author, about 20 to 25 per cent. of all cases sent to the surgeon as instances of chronic appendicitis are in reality cases of habitual torsion of a mobile cecum.

Medical treatment may be employed in these cases, but Klose ridicules any attempt at satisfactory treatment outside of the domain of surgery.

Habitual Torsion of the Transverse Colon is of infrequent occurrence, as shown by the fact that Angspach² was able to find but 9 cases reported in the literature. He reports an additional one of a woman who was apparently cured by colopexy, after having suffered for six years, having five or six attacks each year. A characteristic feature of all the reported cases and one which apparently is of some etiological importance is the dependent transverse colon, extending downward as far as the symphysis.

Volvulus of the Cecum. The rarity of volvulus of the cecum makes the case reported by Pye-Smith³ one of interest.

¹ Münchener med. Wochenschrift, 1910, No. 7, p. 348.

² Berliner klinische Wochenschrift, 1910, No. 26, p. 1222.

³ Lancet, 1910, No. 4535, p. 302.

Intestinal Obstruction. A unique case of obstruction of the small intestine is that reported by Makins¹ in which a fish bone ulcerating through a Meckel's diverticulum caused adhesions which terminated in the obstruction of the ileum.

Metallic Ringing in Ileus. Wilms² claims as a pathognomonic sign of ileus the occurrence of a metallic ringing sound in association with the ordinary intestinal sounds. According to its sponsor, it occurs as the result of the collection of both fluid and gas under pressure within the intestinal coils. In connection with other signs of ileus it can, according to Wilms, be taken as an absolute indication of the early stage of intestinal obstruction. Leuenberger³ attempts to substantiate Wilms' claims by producing these metallic sounds in an artificial reproduction of the conditions existing in ileus.

Chronic Febrile Ulcerous Proctosigmoiditis. The existence of a chronic febrile ulcerous proctosigmoiditis as an independent condition has been denied by a number of clinicians, but Strauss⁴ reports a case with autopsy findings which leaves no room for doubting its existence. As the term indicates, the condition is characterized pathologically by an ulcerous proctosigmoiditis which is limited to these regions and does not extend above the sigmoid. Clinically it is characterized by pain, tenesmus, mucous and bloody stools with an irregular fever, and later emaciation and prostration which may result in death. *Treatment* consists in local applications and in very severe cases Strauss recommends colostomy.

Colitis Mucomembranacea. King⁵ discusses under the term of *colitis mucomembranacea* the conditions to which are usually applied the terms *colica mucosa* and *colitis membranacea*. He considers them different phases of the same disease in which the *colica mucosa* is usually the primary stage and the *colitis membranacea* the secondary stage, though either stage may occur independently of the other.

During recent years there has been much difference of opinion as to appropriate *treatment* of the conditions discussed by King. Whereas in former times when the condition was thought to be essentially inflammatory, a bland diet was prescribed; nowadays many physicians, on the assumption that the condition is essentially a neurosis, prescribe a diet rich in waste material. King assumes a somewhat conservative attitude, and dividing his cases into mild and severe types, prescribes a diet which approaches neither extreme. In addition, he administers daily some form of laxative or, in the severer cases, laxatives in connection with oil enemas.

Hewes⁶ reports the excellent success he has attained with intestinal

¹ Lancet, 1910, No. 4513, p. 567.

² Münchener med. Wochenschrift, 1910, No. 5, p. 225.

³ Ibid., No. 14, p. 542.

⁴ Berliner klinische Wochenschrift, 1910, No. 28, p. 1309.

⁵ Archiv für Verdauungskrankheiten, 1909, Bd. xv, Hft. 3, p. 359.

⁶ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 16, p. 530.

irrigations with a 5 per cent. solution of nitrate of silver in acute bacillary dysentery, and Rosenberg¹ describes the various instruments employed in Albu's clinic for local treatment in diseases of the rectum and sigmoid.

Cancer of Intestines. Cheney,² writing on the general features of carcinoma of the intestines, emphasizes the necessity of a digital examination of the rectum in all cases of abdominal disease, and Kuttner,³ reporting a case of carcinoma of the rectum, contends that in all cases suggestive of tumor formation in the lower bowel a small portion of the suspicious area should be excised for microscopic examination.

Intestinal Diverticula. Diverticulitis of the intestines is becoming a condition of more and more importance, as the cases of both the acute and chronic type are becoming more frequently recognized. An exhaustive clinical and pathological study of intestinal diverticula is made by Hartwell and Cecil.⁴ Their conclusions are that:

(1) Diverticulum of the intestines is a common condition. (2) The large bowel is the most frequent site, particularly the descending colon and the sigmoid. (3) Children and young adults are subject to diverticula, and to the secondary changes occurring in them. (4) All diverticula are probably true in their incipency; the false characteristics are the results of their growth. (5) An inherent weakness existing in the muscularis is probably an important factor in the etiology of diverticula. In the small intestine this weakness appears to exist along the mesenteric attachment. (6) Diverticula undergo the same pathological changes as the appendix vermiformis, and give rise to much the same general symptoms. These pathological changes are not uncommon.

The same condition is discussed by Rowlands⁵ under the title "Sigmoiditis and Mesosigmoiditis," and by Arnsperger⁶ under the title of "Inflammatory Tumors of the Sigmoid Flexure." Arnsperger claims that since the chronic type of diverticulitis of the sigmoid cannot be differentiated with any degree of certainty from carcinoma, radical operative measures should be employed in all cases in which the existence of either condition is suspected.

Taylor and Lakin⁷ give the records of a case of peritonitis originating in an acute perforating diverticulitis.

Giffin and Wilson⁸ present the records of an interesting case of carcinoma of the sigmoid secondary to diverticulitis. Very few cases of

¹ Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1910, Bd. xxi, Hft. 5.

² American Journal of the Medical Sciences, 1910, No. 455, p. 211.

³ Berliner klinische Wochenschrift, 1910, No. 11, p. 473.

⁴ American Journal of the Medical Sciences, 1910, No. 461, p. 174.

⁵ Lancet, 1910, No. 4522, p. 1194.

⁶ Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1910, Bd. xxi, Hft. 4.

⁷ Lancet, 1910, No. 4512, p. 495.

⁸ American Journal of the Medical Sciences, 1909, No. 452, p. 661.

this nature have as yet been reported, but Wilson ventures the opinion that, if exhaustive study is made, they will be found to be more common than is generally considered.

Eosinophilic Intestinal Diseases. The occurrence of eosinophilia, in association with gastro-intestinal diseases, is extremely interesting. Most of the cases in which it has been described have been instances of parasitic intestinal disease. In some cases a general increase in the eosinophiles in the blood has been noted, in others eosinophiles or Charcot-Leyden crystals have been found in the stools. In still other cases, both a general and a local eosinophilia has been observed. Komarowsky¹ reports 4 cases of intestinal disease—2 of amebic dysentery, 1 of severe enterocolitis, and 1 of severe colitis—in which there was local eosinophilia.

Hirschsprung's Disease. An interesting contribution to the study of Hirschsprung's disease is that by Josselin de Jong and Muskens.² They conclude that the condition is a result of an abnormality of the large bowel, consisting of an unusual valve-like formation in the sigmoid or rectum. Pathological studies which they present seem to substantiate their claim, and in view of the fact that up to the present time no satisfactory explanation for the existence of the condition has been offered, their contentions are worthy of serious consideration.

Nutrient Suppositories. For several years Boas³ has attempted to overcome some of the manifold objections to nutrient enemas by the use of nutrient suppositories. One of the most important objections to nutrient enemas is the discomfort they cause the patient which sometimes amounts to an absolute inability to retain them. This can, of course, be overcome, to a great extent, by administering them drop by drop, as was suggested by Boas some years ago. Another objection is the occasional occurrence of unilateral or bilateral parotitis which has, in several cases, led to a fatal termination. Another complication which Boas has met, as a result of the administration of nutrient enemas, is severe hemorrhagic purulent colitis. Nutrient suppositories do not overcome all of these objections, but do some of them, especially the discomfort caused the patient.

The suppositories which Boas has been using are composed of crystallized egg albumen, which Ewald has shown to be well absorbed in the lower bowel, carbohydrate in the form of dextrin, which experience has shown to be the least irritating of all carbohydrates, and emulsified fat in the form of cocoa butter. The analysis of one of Boas' nutrient suppositories 6.2 cm. long by 1.15 cm. thick and weighing about 11 grams gave the following result:

¹ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 1, p. 74.

² Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1910, Bd. xxi, Hft. 4.

³ Berliner klinische Wochenschrift, 1910, No. 14, p. 617.

	Per cent.
Water.	20.51
Inorganic salts and ash.	2.49
Fat	20.09
Carbohydrate	33.55
Albumin	23.36

From these figures it can be calculated that each suppository has a caloric value of 46.2. As four or possibly five suppositories can be given in the course of twenty-four hours, from 185 to 230 calories can be administered in a day. This, of course, is not a great deal and yet it constitutes a fairly satisfactory amount when contrasted with the calories that can be furnished by means of enemas. It is generally recognized that, by the latter means, not more than four or five hundred calories can be furnished in a day, and Plantenga¹ has claimed that it is not possible to administer more than 200 calories per day.

One decided advantage that enemas possess over nutrient suppositories is in the fact that they furnish a certain amount of the water that the body requires. This, of course, can be compensated for by the administration of a saline enema once or twice a day in addition to the suppositories. Boas has, in general, had success with the use of these suppositories. In the vast majority of cases they are well borne and digital examination has shown them to have practically disappeared from the rectum within three to four hours.

Of great importance in rectal alimentation are the results of experiments conducted by Halasz.² He concluded that large amounts of sugar, in the form of a 3 to 5 per cent. solution, can be administered in the form of enemas, and that in this wise from 50 to 200 grams of sugar can be absorbed in from five to six hours. A considerable portion of this sugar must go directly into the systemic circulation and not through the portal circulation; nevertheless, sugar does not appear in the urine. The reason for this, according to Halasz, lies partly in the fact that the absorption is extremely slow and partly in the fact that the different varieties of sugar are not absorbed as such, but in the form of their decomposition derivatives. The bacterial decomposition of the sugar did not amount to more than 0.5 to 1 per cent. and is consequently negligible. An interesting observation of Halasz's was that in several cases, despite the administration of large quantities of sugar, the amount of urine was diminished.

Treatment of Pylorospasm. Two contributions of importance in connection with the *treatment of pylorospasm in infants* are those of Rosenhaupt³ and Rosenstern⁴ on the success which they attained by the use of saline enemas and rectal instillations. Rosenhaupt used

¹ Inaug. Dissert., Freiburg, 1898.

² Deutsch. Arch. f. klin. Med., 1910, Bd. xeviii, Hft. 4 and 6, p. 433.

³ Deutsche med. Wochenschrift, 1909, No. 41. ⁴ Ibid., 1910, No. 1, p. 31.

ordinary saline enemas, whereas Rosenstern used Ringer's solution, instilling about 30 or 40 drops per minute. Employing these instillations for two hours twice a day, about 500 c.c. can be introduced. Ringer's solution is composed of 7.5 gram of sodium chloride, 0.42 gram of potassium chloride, 0.24 gram of calcium chloride to a liter of water.

Bacteria of the Gastro-intestinal Tract. Friedenwald and Leitz,¹ studying the bacterial content of the feces and the influence upon it of intestinal antiseptics, conclude that:

1. Regulations of diet, together with the evacuation of the bowels, is the most effectual method that we have of reducing the excessively high bacterial content of the intestine.

2. Betanaphthol and bismuth salicylate appear to be our most effectual intestinal antiseptic drugs in normal individuals, while aspirin and ichthalbin effect slight reduction, and salol gives no results whatever.

3. The results produced by means of intestinal antiseptics in patients suffering with gastro-intestinal disturbances do not seem to be marked, whereas the best results are obtained by regulation of the diet.

INFLUENCE OF VARIATIONS IN DIET ON INTESTINAL BACTERIA. The profound influence that variations in diet have upon the intestinal bacteria is shown by recent experimental work of Herter,² of which he gives a preliminary report. Monkeys, a few cats, and men were fed alternately upon diets almost exclusively protein and almost exclusively carbohydrate. On the protein diet, the predominating organism in the feces was an actively proteolyzing bacillus resembling the bacillus subtilis. When the diet was changed to one consisting almost exclusively of carbohydrates, evidences of degeneration of this type of organism could be observed and shortly an almost complete substitution of these organisms by a Gram-positive acidophilic bacillus could be observed. Moreover, on the protein diet distinct evidences of putrefaction could be observed in both feces and urine, which disappeared on the change of diet. Especially interesting were the clinical changes which seemed to characterize the two types of diet. This was noted especially in the monkeys who, on the proteid diet, seemed dull, stupid, and evidently ill; on the change of diet, they resumed their normal, active, interested attitude.

OPPLER-BOAS BACILLUS. Extremely important observations on the bacteriology of the gastro-intestinal tract, especially in regard to the Oppler-Boas bacillus, are those of Lindemann.³ He concludes that Oppler-Boas bacilli can be found in the gastric contents and the

¹ American Journal of the Medical Sciences, 1909, No. 452, p. 653.

² Internat. Beitr. z. Path. u. Therap. d. Ernährungsstörungen, 1910, Bd. i, Hft. 3, p. 275.

³ Ibid., Hft. 4, p. 506.

feces in almost all cases of achylia and high degrees of hypochlorhydria. Their point of entrance is the mouth. The microscopic demonstration of Gram-positive long bacilli in the gastric contents or in the feces does not justify diagnostic conclusions, on account of the fact that there are other Gram-positive bacilli to be found here. If an extremely large number of them is present, they in all probability are Oppler-Boas bacilli. Cultures must be made, however, for a positive diagnosis. The finding of Oppler-Boas bacilli does not justify the conclusion that there is lactic acid fermentation in the stomach. All that is necessary for their growth is achylia, or a considerable degree of hypochlorhydria. When, in addition to the absence of free hydrochloric acid, there is a considerable degree of motor disturbance in the stomach, lactic acid can be produced. Lindemann contends that the term lactic acid bacilli is not an appropriate one for the Oppler-Boas organism, as other organisms, such as bacterium coli and various Gram-positive diplococci, are capable of producing lactic acid.

INTESTINAL FERMENTATION. Sommerville¹ emphasizes the importance of recognizing the character of the fermentation which may be responsible for gastro-intestinal irregularities, and observed the same fact, as did Herter from his experimental work, that the type of the predominating organisms in the gastro-intestinal tract is dependent almost entirely upon the character of the food.

Bactericidal Property of Intestines. Schütz² conducted investigations on the bactericidal property of the intestines and concluded that the living cells of the intestinal mucosa possess active bactericidal properties, but that this property is not possessed by either the secretions or the extracts of these cells.

Sodium Chloride in Feces. Under the title of "New Feces Investigations," Ury³ considers the amount of the substances in solution in the feces, principally sodium chloride. As these substances are derived from the fluids secreted by the intestinal wall, Ury claims that they serve as a reliable index of the pathological secretory condition of the intestines. Some observations which I conducted on the amount of sodium chloride contained in the feces showed that the amounts thus excreted were almost entirely dependent upon the condition of the kidneys and the amount of sodium chloride excreted by them. As Ury does not take this factor into consideration, I do not believe that he is wholly justified in the conclusions which he draws.

Therapeutic Use of Lactic Acid Bacilli. Since the publication of Metchnikoff's contributions on the use of lactic acid bacilli, both physicians and laymen have become so hysterical in the use of this agent and such a

¹ Lancet, 1910, No. 4530, p. 1750.

² Münchener med. Wochenschrift, 1909, No. 33, p. 1683.

³ Internat. Beitr. z. Path. u. Therap. d. Ernährungsstörungen, 1910, Bd. i, Hft. 3, p. 368.

vast number of preparations of various types of lactic acid bacilli have been put on the market, that it is refreshing to have several reliable estimations of the value of this measure. Two publications, in particular those of Einhorn, Wood, and Züblin,¹ and Medalia,² indicate that the enthusiasm which has been manifested in most of these lactic acid preparations is by no means justified. The former observers conclude from their exhaustive clinical and bacteriological studies that lactic acid bacilli by no means constitute the panacea which they have been considered. The various dried preparations of lactic acid bacilli were so variable in their composition that little uniformity of results attended their use. Even the *Bacillus bulgaricus*, which grew best in an artificial medium, encountered so many obstacles to its growth in the intestinal tract that little therapeutic value could be expected from it. In some cases it seemed to be of value, but this was not the rule; the results attending its use seem to be greatly dependent upon the quality of the preparation employed. A reliable method of determining the value of a lactic acid preparation would be its microscopic and cultural analysis, but this is, of course, not feasible in the majority of instances. On account of the great variations in age and composition of the various dried preparations and tablets on the market, we have little guarantee that from their use the desired result would be obtained. In conclusion, the authors mention that the administration of lactic acid bacilli by no means constitutes the only method at our disposal of controlling intestinal putrefaction; the same result can be obtained by the use of a milk-vegetable diet.

Medalia, as a result of his studies, concludes that:

1. Lactic acid milk, when prepared at home from tablets, is unreliable as to taste and bacterial content.

2. The objection to the use of the tablets in their dry state is their unreliable bacterial content, the loss of viability of organisms in their dry form, and the high price.

3. Buttermilk, pure and simple, when obtained from the dairyman, varies considerably as to taste (at times very sour, sometimes bitter) and bacterial content and is, therefore, unreliable. It is also deprived of the principal nourishing elements of milk. (The buttermilk as obtained from the dairyman is a side product with him, is the watery fluid left after churning the butter and, as such, probably not much attention is paid to its keeping, handling, etc.)

4. The Bulgarian lactic acid bacillus, so highly recommended by Metchnikoff, produces too much acid, which taste is not tolerated by most patients. For this reason Metchnikoff is now advocating the use of the paralactic organism mixed with the *Bacillus bulgaricus*, in order to obtain a better tasting soured milk. Which of these two

¹ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 3, p. 300.

² Boston Medical and Surgical Journal; 1910, vol. clxii, No. 22, p. 739.

organisms is responsible for the good results cannot be definitely determined, as the *Bacillus bulgaricus* does not grow readily at room temperature and is, therefore, outgrown by the *paralacticus*, which grows most readily at room temperature. It might be safe to say that the beneficial results are apparently due to the latter.

5. A good, clean, soured milk can be obtained by means of any lactic acid organism in pure culture implanted in sterilized but not boiled milk. The palatability, however, being an important factor, makes it necessary to choose the organism best suited for this purpose.

6. The therapeutic value of soured milk depends chiefly upon the lactic acid organisms it contains, as well as upon the fact of its being a good food article, and not upon any particular kind or variety of the lactic acid organism. Any clean palatable milk, properly soured, would answer the purpose.

7. A good tasting buttermilk can be prepared at home from sterilized milk with a "starter" of lactic acid organisms. One starter will last for several weeks or months if the directions for the preparation described in the article are carefully followed. A new starter should be obtained upon the first sign of contamination detected in taste or in change in the manner of curdling.

8. The *Bacillus bulgaricus* in pure culture in dextrose bouillon as a therapeutic application in infectious processes, although of benefit in certain conditions as a good local antiseptic, is not a cure-all and must be used with caution. In the oral cavity it should be used with great care, if at all, because the action of the lactic acid upon the enamel may give rise to caries.

9. Public safety demands that the various buttermilks or soured milks on the market should be thoroughly inspected by the health and pure food authorities.

Preparation of Buttermilk. Medalia gives the following directions for preparing good buttermilk at home:

1. Take one quart of ordinary milk daily. (If the fat is not desired, order one quart of fat-free milk from the milkman.)

2. Pour off one-half cupful from quart bottle (to make room for starter).

3. Replace lid or cork (not tight).

4. Put the quart bottle containing milk in a saucepan of cold water.

5. Bring the water around the bottle of milk to a boil and keep it boiling for one-half to one hour (to sterilize the milk). Do not boil the milk.

6. Remove the bottle of milk from the boiling water and let it stand in a cold place until it cools.

7. When the milk is cold, shake up the starter (in a little bottle) and introduce it carefully into the milk.

8. Put on a cork or lid tight and shake it.

9. Place the bottle in a warm place (at an even temperature) on the kitchen shelf (not any warmer than body temperature) for twenty-four hours.

10. At the end of twenty-four hours the milk is fermented and should be of the same consistency and smoothness as that of cream.

11. The next morning take your second quart of milk and repeat the process exactly as you did with the first quart of milk (pouring off one-half, a cupful sterilizing the remainder, cooling it).

12. Pour in a little less than one-half a cupful of the first quart of the already fermented milk in order to start the second, instead of starting your second quart with a starter as described.

Yoghurt. Ohly¹ reports rather more success than the above-mentioned authors with the use of one of the lactic acid bacillus preparations known as Yoghurt. He considers it a valuable addition to our therapeutic equipment, both on account of the action of the organisms it contains and on account of the nourishment which it affords the patient. He finds it especially serviceable in achylia gastrica, and in almost all intestinal derangements not characterized by high degrees of atony. He did not find it servicable in gastric diseases characterized by hyperacidity or hypersecretion.

Schmidt Diet. Robin² reports the success that has attended his use of the Schmidt diet in the diagnosis of gastro-intestinal disorders, and contends that the diet should be used in every case of chronic intestinal disease. Lynch³ also claims to have had success with its use.

Comparison of Schmidt Diet and Pearl Test. Wells⁴ compared the results of the Schmidt diet and the Einhorn pearl test in a series of cases, and concluded that the pearl test is sufficiently reliable for all practical purposes in the majority of cases, that on account of the ease of the determination of the results of the test it can be used more generally than the Schmidt diet, and that it is generally easier to employ when the patient is not in a sanatorium. He believes that when the regulations of diet, determined according to the results of the pearl test, are not productive of satisfactory results, then the Schmidt diet should be employed.

Angina Abdominalis. Though it is not many years since angina abdominalis was first described, the condition is constantly receiving more and more attention. The cardinal symptoms of the condition are paroxysmal pains in the region of the stomach, pains throughout the rest of the abdomen, especially in the neighborhood of the umbilicus,

¹ Münchener med. Wochenschrift, 1909, No. 35, p. 1790.

² Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 1, p. 35.

³ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 2, p. 35.

⁴ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 3, p. 347.

and meteorism. According to Kreuzfuchs,¹ four general types of the disease can be recognized as follows:

In the first type there is a general arteriosclerosis with prominent cardiac symptoms and, in addition, occasional symptoms, such as those mentioned above, in the abdomen.

The second type includes those cases in which both cardiac and abdominal symptoms are present, either simultaneously or alternately and of approximately equal severity. Kreuzfuchs mentions in connection with this group that abdominal symptoms are especially likely to occur in those cases in which the cardiac or vascular disease is dependent upon vascular spasm, in other words, angina pectoris and intermittent claudication.

The third group comprises those cases in which there is evident disease of the heart and great vessels, but in which the manifestations of the gastric and intestinal disease predominate.

In the fourth group are those cases in which there are no manifestations of cardiac disease, but in which there is an apparent arteriosclerosis of the abdominal vessels producing characteristic symptoms.

The *abdominal symptoms* in any one of these groups may differ to a certain extent in accordance with whether the stomach or the intestines are especially affected. In all of them the characteristic feature is the paroxysmal attacks of pain. These pains, which are extraordinarily severe and often last for hours at a time, usually occur quite independent of the taking of food, but are apparently very materially dependent upon physical exertion and emotional excitement. Especially when the involvement is greatly intestinal does the meteorism become an alarming symptom. The abdomen becomes more and more prominent, and the rigidity and distention greater and greater until the patient feels as though the intestines were being torn apart; the diaphragm is pushed upward, and dyspnea and cardiac embarrassment add themselves to the picture.

Etiologically, all of those factors come into play which are of importance in the production of arteriosclerosis in general; however, Kreuzfuchs finds *nicotine* to be an especially important factor in the cases which have come to his notice.

Therapeutically, those drugs are useful which are of service in other forms of arteriosclerosis, especially the iodides, the nitrites, and diuretin. For the relief of the attack itself, however, other means must be employed. Among these are hot abdominal compresses, hot drinks, and hot enemas. However, the most serviceable of all means of controlling the attack is the administration of morphine, which, according to the author, frequently acts in an astoundingly happy manner. Between the attacks the patient should be taught to avoid all physical,

¹ Deutsche med. Wochenschrift, 1910, No. 7, p. 306.

mental, and emotional strain and if, as is so frequently the case, there is abuse of nicotine, this must be controlled.

Kreuzfuchs finally warns against the dangers of a senseless use of digitalis and its derivatives, a practice which he has found to be a common one among physicians in all varieties of arteriosclerotic disease.

X-rays in Gastro-intestinal Diseases. Hürter¹ draws the following conclusions as to the use of radioscopy and radiography in the gastro-intestinal tract in Matthes' clinic: 'The use of the skiagraph in diseases of the esophagus gives the most excellent results and is much preferable to the use of esophageal bougies. It permits the recognition of constrictions too slight to be determined by other means and gives much more reliable data in regard to dilatations and diverticula than do other means. In the stomach, skiagraphy enables us to determine the form and position of the stomach as we could not do by other means. It does not permit the determination of reliable data in gastric ulcer or early carcinoma, but, on the other hand, does permit of the determination of reliable data when either of these conditions has effected any change in the contour of the stomach. In the intestines skiagraphy is of great assistance in the diagnosis of diseases, especially stenosis of the large intestines, but is of little assistance in diagnosis of diseases of the small intestines. Hürter further states that in the case of sharply circumscribed abdominal pain skiagraphy enables us to determine if this has its origin in the stomach, small intestines, or large intestines.

X-rays in Gastric Ulcer. Haudek's² studies of the results of skiagraphy in gastric ulcer led him to conclude that this means is of no assistance in the diagnosis of a superficial ulcer. On the other hand, penetrating ulcers in the fundus of the stomach can be recognized by the shadow caused by the collection of bismuth in the bulging of the gastric wall at the seat of the ulceration.

Use of Glutoid Capsules in Skiagraphy of Gastro-intestinal Tract. A measure that appears to be a distinct advance in our diagnostic technique of diseases of the gastro-intestinal tract by means of the skiagraph is that proposed by Tornai³ of administering the bismuth in various-sized glutoid capsules instead of in the form of an emulsion. He uses capsules of respectively 6, 8, and 10 mm. in diameter. The use of these capsules of different size he finds especially serviceable in the diagnosis of constrictions of the gastro-intestinal tract and estimates the size of the stricture by determining how large a capsule can pass. In determining the position of the lower pole of the stomach, he finds that he is able to use a much smaller quantity of bismuth when in capsules than must be employed in the form of an emulsion and consequently there is less danger of the weight of the bismuth causing the lower pole

¹ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 2, p. 202.

² Münchener med. Wochenschrift, 1910, No. 30, p. 1587.

³ Berliner klinische Wochenschrift, 1910, No. 29, p. 1353.

to appear deeper in the abdomen than it actually is. Another advantage is that there is less danger of bismuth poisoning because the glutoid capsule is seldom dissolved until it reaches the lower portion of the intestinal tract.

Determination of Gastric Motility and Secretion by X-rays. Schlesinger¹ contends that with the administration of an appropriate bismuth emulsion, the motility of the stomach can be well estimated by means of the Röntgen rays, and that the objection so frequently made that the bismuth emulsion remains for some time in the dependent portions of the stomach does not hold good under these circumstances. In a subsequent article he² claimed that the amount of fluid which remains above the bismuth emulsion and shows as such in the skiagraph can be used as an index of the amount of gastric secretion. As the bismuth emulsion is such a poor stimulus to gastric secretion, I doubt very much if this claim will prove itself to be of any real value.

X-ray Diagnosis of Gastropptosis. Gastropptosis has been a much discussed topic by skiagraphers. Groedel³ claims that what we usually call gastropptosis is in reality a pyloroptosis, and that in its estimation we should be guided not by the position of the lower pole of the stomach but by the position of the pylorus. He claims this condition to be the result of diminished intra-abdominal tension and possibly also deficient fixation of the pylorus. It is frequently a sequel of what he considers a gastrectasis, resulting from the weight of food, in which the stomach is increased greatly in length. Atonic gastrectasis, which is characterized by increase in both breadth and length of the stomach, he considers to be recognizable in the skiagraph by the presence of the stomach contents in the lower portion, and the presence of an abnormally broad area of air in the upper portion; between the two a constriction can be seen.

Bönniger⁴ does not agree with Groedel in regard to gastropptosis. The usual form of gastropptosis he considers to be a congenital condition, in other words, a manifestation of an asthenic habitus. The stomach in this condition is abnormally long, and, on account of the narrow inferior aperture of the thorax, assumes an unusually vertical position. He considers that its degree should be estimated by measuring from the upper pole of the stomach to the lower pole, and not by determining the position of the pylorus alone.

Living Creatures in Gastro-intestinal Tract. Most physicians have been inclined to accept the reports of the existence of living creatures, insects and animals, within the gastro-intestinal tract as based upon insufficient or false observations. According to Fenwick,⁵ however,

¹ Berliner klinische Wochenschrift, 1910, No. 7, p. 280.

² Deutsche med. Wochenschrift, 1910, No. 14, p. 657.

³ Ibid., No. 15, p. 701.

⁴ Berliner klinische Wochenschrift, 1910, No. 10, p. 433.

⁵ British Medical Journal, 1910, No. 2563, p. 371.

many of the reports of such occurrence are reliable. According to him there is little difficulty in collecting at least 130 examples of cases in which insects were present within the gastro-intestinal tract. Most of these belonged to one or the other of three of the fifteen natural orders—the Diptera, or two-winged flies, the Coleoptera, or beetles, and the Lepidoptera, or butterflies and moths.

The larvæ of many varieties of Diptera are on record as having been vomited or passed by the bowel in the case of affected individuals. More than forty instances are recorded in literature in which they or their larvæ have been identified in the vomit or evacuations of persons suffering from symptoms of gastro-intestinal irritation. Among these are at least twenty-four different varieties of beetles; the larvæ of many of these are of considerable size, those of the *Blaps Mortisaga*, for instance, measuring as much as $1\frac{1}{2}$ inches in length. Twenty-two different varieties of parasitic caterpillars have been identified as having been discharged from the gastro-intestinal tract.

Some credence is given to these observations by the fact that experiment has shown that the larvæ of flies introduced into the stomachs of guinea-pigs and frogs are able to live at least three days, and that the larvæ of the blow-fly not only withstands prolonged immersion in water but resists artificial peptic and pancreatic digestion for six or seven hours, and many species of beetles have showed themselves to possess extraordinary vitality.

Probably the most famous case of parasitism of this nature is that of Mary Riordan, who excited widespread interest during the third decade of the last century, and who was carefully watched by many observers for more than three consecutive years. This young woman, who was highly neurotic and steeped in superstition, made it a practice for two years to remove clay from the graves of some priests of extreme sanctity and to mix it with her daily food. When first seen by Pickells she complained of severe gnawing and cramping pains in the abdomen, nausea, giddiness, and retching, and was subject to attacks of catalepsy. At intervals violent vomiting would occur, attended by the ejection of various larvæ mixed with blood and mucus. In these attacks the patient would scream with pain and describe herself as suffering the tortures of hell, and was sometimes seized with epileptic convulsions. During the first year of her illness 700 larvæ, most of which were alive, were vomited and about 100 passed by the bowel, while in the course of the next eighteen months nearly 1300 were counted. For three years and a quarter these parasites continued to increase in number and the patient remained extremely ill. After numerous remedies had been tried in vain, the administration of six ounces of turpentine each day produced the discharge of immense numbers of larvæ, pupæ, and insects, after which the pain and vomiting subsided and the girl was restored to health.

Fenwick doubts the reliability of most, if not all, of the instances in which slugs are reported to have been present in the gastro-intestinal tract. He has the same to say in regard to lizards, most of the reported cases of which can be attributed to the acts of hysterical or insane women. In regard to worms, leeches, and amphibia, such as frogs, it is probable that they may live in the stomach for a short time, but it is doubtful if any of the cases in which such an animal is supposed to have existed in the stomach for more than a few hours are authentic.

According to Fenwick, the only carefully attested instance of a snake living for more than a few hours after being swallowed is that recorded by Mandt.¹ The subject of this incident was a Russian peasant who, when sleeping in a forest, was awakened by the sensation of something passing down his throat. Upon examination, a rounded body could easily be felt moving about in the stomach, and a loud bruit was audible through the stethoscope. In spite of vigorous medicinal treatment the movements did not cease until the third day, and nearly a fortnight elapsed before a viper, measuring twelve inches in length, was expelled from the bowel. The reptile belonged to a species the bite of which excited inflammation, but was not fatal.

DISEASES OF THE PERITONEUM

Disappearance of Liver Dulness. The disappearance of liver dulness has in the past been more or less looked upon as a sign of gas or air free in the peritoneal cavity. Within recent years, however, clinicians are learning to look upon the sign as of little diagnostic significance in this connection, for it has been frequently observed that the liver dulness may disappear in cases of meteorism. Kirchheim² has made an experimental study of the disappearance of liver dulness in tympanitic affections of the abdomen. He concludes that the disappearance of liver dulness early in cases of peritonitis is caused by the interposition of one or more coils of intestines between the liver and the anterior abdominal wall. Late in peritoneal inflammations, or in other conditions in which there is both extensive tympanites and a high degree of rigidity of the abdominal wall, the disappearance of liver dulness is due to upward and backward rotation of the liver upon its transverse axis so that practically nothing more than the anterior edge of the liver comes in contact with the abdominal wall.

Pneumoperitoneum. Herrick³ proposes a novel means of assistance in the diagnosis of conditions characterized by the presence of free air or gas in the peritoneal cavity. It consists merely in the introduc-

¹ Dublin Medical Press, 1840, vol. iii, p. 408.

² Deutsch. Arch. f. klin. Med., 1909, Bd. xevii, Hft. 5 and 6, p. 594.

³ Archives of Internal Medicine, 1910, vol. v, No. 3, p. 246.

tion of an exploring needle with lateral openings into the peritoneal cavity; to the external end of this exploring needle is attached a rubber tube which runs to the long arm of an ordinary laboratory wash-bottle. A partial vacuum is created in the bottle by means of a small rubber bulb attached to the short arm. If any gas is present in the peritoneal cavity it will thus escape through the exploring needle and can be recognized by its bubbling up through the water in the wash bottle.

Gaseous Distention of Abdomen and Flatulence. Ewald¹ discusses the various types of collections of gas or air that occur within the abdominal cavity. Gas in any of the abdominal organs must be derived either from air which is swallowed or from the decomposition of ingested foodstuffs. Considering only those collections of gas which do not result from a mechanical obstruction in the course of the gastro-intestinal tract, Ewald recognizes (1) gastric meteorism, (2) intestinal meteorism, (3) flatulence, and (4) gas free in the peritoneal cavity.

Gastric meteorism may result from the abnormal swallowing of air, which usually occurs as a manifestation of hysteria and then known as *aërophagia*, or from abnormally active fermentative processes in the stomach occurring usually as a result of gastric atony. A third variety of gastric meteorism is the acute gaseous distention occurring in acute dilatation of the stomach. The *treatment* of the hysterical type of gastric meteorism which is usually extremely resistant to treatment, consists in the application of psychotherapeutic measures. In the second type, treatment must be directed toward the gastric atony and only such foods administered as are not readily subject to fermentation. Acute meteorism, Ewald treats by the frequent introduction of a stomach tube to permit egress of the collected gases.

Intestinal meteorism may also be divided into an exogenous and an endogenous form, the latter caused by the decomposition of the intestinal contents, the former by the swallowing of air. Here also we may recognize a hysterical form of meteorism and a form associated with organic disease. In the hysterical form the most extraordinary degrees of abdominal distention can be obtained. The condition is in all probability caused by an extreme degree of relaxation of the intestinal musculature. High degrees of the organic form of intestinal meteorism Ewald mentions as being observed in the course of typhoid and typhus fevers, in diffuse peritonitis, in affections of the central nervous system, especially in the later stages of meningitis, in cholelithiasis, and occasionally as an early symptom in angina pectoris. Finally it may occur in the form of postoperative ileus, and as a result of catarrhal and other inflammatory intestinal derangements.

In the hysterical form of intestinal meteorism, Ewald approves of the use of some of the older remedies, especially *asafetida*. The most

¹ Deutsche med. Wochenschrift, 1910, No. 14, p. 641.

reliable treatment, however, consists in the production of narcosis either by morphine or by chloroform. Occasionally, however, the meteorism returns as soon as the effect of the narcotic has subsided; in this case the administration must be repeated. In postoperative meteorism, Gelinsky has recently strongly recommended the application of hot air to the abdomen. Ewald in the past had good results in many instances from puncture of the distended coils of the intestines through the abdominal wall and does not recall ever having had a case of peritoneal infection from this procedure. He has never seen the use of the rectal tube afford much relief in this condition. In alimentary or catarrhal meteorism, regulation of the diet combined with the administration of mild aperients is usually productive of beneficial results.

As distinguished from meteorism or tympanites, in which there is great abdominal distention, Ewald next considers *flatulence* which is characterized by the expulsion of large amounts of gas *per rectum*, but is seldom accompanied by any abdominal distention. Here again there are two principal types, a nervous type and a type dependent upon disturbances of intestinal digestion. The treatment of the former is psychotherapeutic associated with the administration of asafetida or similar remedies; treatment of the latter is dietetic.

Free gas within the peritoneal cavity always results from the perforation of an air-containing viscus and its treatment is purely surgical.

Boas¹ contributes an article of practically the same scope and presenting to a great extent the same views as does Ewald, excepting that he takes a somewhat broader conception of the term "flatulence," including under it meteorism and tympanites. He states that the most serviceable drug he has encountered in the treatment of gaseous fermentation in the intestines is magnesium salicylate.

METEORISM IN INFECTIONS. Krönig and Klopstock² call attention to the importance of meteorism in the acute infections, especially pneumonia. Occasionally, according to these authors, it is so prominent a symptom as to lead to the diagnosis of an abdominal rather than a pulmonary affection. According to their view, it is the result of the action of the specific toxins on the centre in the medulla governing intestinal movements.

ABSORPTION OF GAS FROM INTESTINES. Kato,³ in a study of the absorption of gas in the intestines, concludes that the major portion of the intestinal gases is not discharged *per rectum* but absorbed by the intestinal wall. The absorption of CO₂ is especially active, that of O less active. In experiments lasting but a short time, H and N

¹ Berliner klinische Wochenschrift, 1910, No. 3, p. 89.

² Deutsch. Arch. f. klin. Med., 1909, Bd. xevi, Hft. 5 and 6, p. 515.

³ Internat. Beitr. z. Path. u. Therap. der Ernährungsstörungen, 1910, Bd. i, Hft. 3, p. 315.

were not at all absorbed. Diffusion plays practically no part in the disappearance of gases from the intestines. Gaseous distention of the abdomen results very rapidly from diseases affecting the portal circulation, whereas absorption is hindered very little if at all by inflammatory affections of the intestines.

Acute Peritonitis. Mayo-Robson,¹ writing on acute peritonitis of the upper abdomen, mentions as the organs that may be responsible for this condition, the stomach, duodenum, jejunum, colon, gall-bladder, bile ducts, pancreas, liver, spleen, an upward displaced appendix, the kidneys, or inflamed lymphatic glands, and that the principal lesions affecting these organs to give rise to the peritonitis are ulcer, perforation, abscess, concretions, hydatids, cancer, and internal hernia. He gives a very satisfactory résumé of the characteristic features of each of these conditions and illustrates his remarks by reciting histories from his own records.

Laxatives in Peritonitis. Ochsner² pleads for the prevention of peritonitis by the early recognition and appropriate treatment of those conditions which may lead to peritonitis, and emphasizes the importance of not giving cathartics in cases of incipient peritonitis. It has not only been Ochsner's experience that early peritonitis is much aggravated by the administration of cathartics, but one of his assistants has proved experimentally, by the injection of lampblack into the peritoneal cavity, that the administration of cathartics causes a rapid dissemination of previously localized material throughout the peritoneal cavity. In intestinal obstruction the administration of cathartics is probably even more harmful than in cases of incipient peritonitis; Ochsner states that the mortality in cases of intestinal obstruction in which cathartics has been used is at least four times as great as in those in which no cathartics have been used. In both of these conditions the best treatment to be employed until more radical measures have been decided upon is gastric lavage.

Pain in Abdominal Diseases. Maylard³ gives an exhaustive discussion of reflex pain in the abdominal viscera from the standpoint of our present knowledge of anatomy and physiology.

Nyström⁴ critically reviews the various theories concerning the sensibility of the abdominal organs, and concludes that, in the main, the views of Lennander, as detailed in *PROGRESSIVE MEDICINE* for 1908, are correct.

Abdominal Rigidity. In a study of the cause of abdominal rigidity, Hoffmann⁵ lends support to Lennander's view by concluding that

¹ British Medical Journal, 1910, No. 2558, p. 61.

² Boston Medical and Surgical Journal, 1910, vol. clxii, No. 6, p. 161.

³ British Medical Journal, 1910, No. 2567, p. 616.

⁴ Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1909, Bd. xxi, Hft. 1.

⁵ Deutsche med. Wochenschrift, 1910, No. 26, p. 1225.

abdominal rigidity in abdominal diseases occurs only as a result of irritation of the parietal peritoneum, and that it is produced through the intervention of the intercostal, lumbar, and sacral nerves. Abdominal rigidity can be produced by the stimulation of the intercostal, lumbar, or sacral nerves in any part of their course. Abdominal rigidity can occur when the peritoneum is perfectly healthy in cases of severe basal pleurisy through radiation, especially in pneumonia. Section of the spinal cord in the middle or upper thoracic region does not prevent abdominal rigidity when the parietal peritoneum is irritated.

Peritoneal Pseudomyxoma. An interesting case of peritoneal pseudomyxoma originating from the appendix is reported by Trotter.¹ At operation no trace of the appendix could be made out in the mass of colloid material that was present in the appendix region. A large mass of the omentum which was involved in the colloid growth was removed, and the wound closed. Since then the patient has had no abdominal symptoms whatever, and now, eighteen months after operation, abdominal examination reveals no abnormal signs. According to Trotter, the cases of peritoneal pseudomyxoma which have been reported have come under observation in four different ways: (1) As an unexpected postmortem condition when there had been nothing clinically to suggest its presence; (2) as a cause of slow but pronounced abdominal enlargement, in one case lasting ten years; (3) as an unexpected discovery during an operation for hernia; and (4) during operation for appendicitis.

DISEASES OF THE LIVER

Levulosuria. The value of levulosuria in the functional diagnosis of liver disease is materially increased by recent clinical and experimental investigations by Hohlweg.² The greatest reduction in the tolerance for levulose he found in cirrhosis, catarrhal icterus, and occlusion of the common bile duct by stone. Primary or secondary tumors of the liver produce very little if any alimentary levulosuria. Enlargements of the liver secondary to leukemia or anemia seldom produce an alimentary levulosuria, and chronic passive congestion of the liver does so only in cases of extremely severe degree and long duration.

The experimental work was especially interesting. Hohlweg produced various degrees of liver destruction in dogs by the subcutaneous injection of a mixture of chloroform and paraffin. The degree of alimentary levulosuria was then determined. The dog was then killed, after which the amount of liver destruction was estimated as well as the degree of glycogen-building ability. Hohlweg found that there was a definite parallelism between the amount of liver destruction, the decrease

¹ British Medical Journal, 1910, No. 2568, p. 687.

² Deutsch. Arch. f. klin. Med., 1909, Bd. xevii, Hft. 5 and 6, p. 443.

of tolerance for levulose, and the interference with the glycogen-building properties of the liver.

Jaundice. Though *chronic family jaundice* or, as it is frequently called, *congenital family cholemia* is not essentially a disease of the digestive system, its most prominent symptom, jaundice, is so universally identified with disease of the liver that I believe we will be justified in briefly considering it here. The condition was first accurately described by Minkowski, in 1900, though it was probably previously recognized by both Murchison and Hayem. Within recent years the condition has been more and more frequently diagnosticated, and during the past year a considerable number of cases have been reported. The first article and report of cases to occur in this country, and one which contains an excellent consideration of the subject is that by Tileston and Griffin.¹ These authors describe the characteristic features of the condition as follows:

Jaundice appears in several members of a family, frequently in two, three, or even four generations. It either dates from birth or is first noticed during adolescence, and persists throughout life; yet in spite of the long duration, the patient experiences little inconvenience from his complaint, and may attain an advanced age. The growth of these children is not interfered with. The icterus is usually not intense, there are no signs of obstruction of the bile ducts; and symptoms of cholemia, such as itching, slow pulse, xanthomas, and multiple hemorrhages, are lacking. The stools are highly colored, and the urine contains urobilin, but no bile. Enlargement of the spleen which may reach high proportions, is almost a constant feature, while the liver is usually not at all or only slightly enlarged. As a rule, there is a moderate grade of anemia. "Bilious attacks" are extremely common, especially in youth; after an indiscretion in diet, a period of constipation, or without obvious cause, the patient feels tired and depressed, the jaundice deepens, and there is repeated vomiting of bile. Headache, diarrhea, and slight fever are occasionally noted. After a day or two the attack passes off, to occur usually several times a year. Attacks of abdominal pain, located in the epigastrium or right hypochondrium, are met with in a large proportion of cases, and are due to a complication with gallstones. The enlarged spleen often causes a feeling of weight and pressure in the left side of the abdomen. Pain in this region, sometimes accompanied by a friction rub, is a not infrequent occurrence owing to a complication with perisplenitis. A history of nosebleed, particularly during adolescence, is almost always to be obtained, but hemorrhages from other organs, and especially from the stomach and intestines, are not met with—an important distinction from splenic anemia and cirrhosis. Apart from the attacks mentioned above, the subjects, as Chauffard aptly remarks, are rather jaundiced than

¹ American Journal of the Medical Sciences, 1910, No. 459, p. 847.

sick. However, there is often a feeling of lassitude and a tendency to somnolence.

The *etiology* of the condition has been a matter of much discussion, but most investigators are now agreed that an abnormally rapid destruction of red blood corpuscles, especially at the time of the attacks, is responsible for the condition. This view is based to a great extent upon Chauffard's discovery of an increased fragility of the red blood corpuscles in the disease. The icterus is consequently a hemolytic rather than a hepatogenous one.

In their article Tileston and Griffin report 13 cases of chronic family jaundice occurring in four families. Poynton¹ reports 3 cases occurring in one family, and Weber and Dörner² report a family in which a man, two daughters, and a son were all subjects of the disease under discussion, while Aschenheim³ reports the case of a father and son, both subjects of the disease.

REPEATED JAUNDICE IN PREGNANCY. An extremely interesting condition, the nature of which is quite obscure, is reported by Rolleston.⁴ The case was that of a woman who, though she never had jaundice at any other time, became jaundiced in four successive pregnancies, and the first three infants died of jaundice. During the fourth pregnancy she was treated with urotropin and salicylate of sodium and gave birth to a healthy infant.

An even more remarkable case of a similar nature is reported by Nason.⁵ A woman, after having had two normal pregnancies, became jaundiced in her third pregnancy and gave birth to a jaundiced infant which died when it was four weeks old; in the next two pregnancies there was a similar sequence of events. In the sixth pregnancy she became jaundiced and gave birth to an infant which became jaundiced on the second day; the jaundice in this child disappeared. In the seventh pregnancy she became slightly jaundiced, but this condition disappeared and the infant though not jaundiced died at the age of five weeks from infantile diarrhea. Three subsequent pregnancies were not unusual.

Cirrhosis of Liver. Really nothing worthy of note concerning cirrhosis of the liver has appeared during the past year. Warschauer⁶ contends, on the basis of the histological analysis of a case coming under his observation, that the present view of the primary destruction of liver tissue with the secondary growth of the periportal connective tissue does not hold good for all cases. In his own case, he claims to find evidence of a primary proliferation of the periportal connective tissue.

¹ Lancet, 1910, No. 4507, p. 153.

² Ibid., No. 4508, p. 227.

³ Münchener med. Wochenschrift, 1910, No. 42, p. 1282.

⁴ British Medical Journal, 1910, No. 2571, p. 864. ⁵ Ibid., No. 2573, p. 989.

⁶ Deutsche med. Wochenschrift, 1910, No. 20, p. 929.

Blakely¹ reports one of those interesting cases of alcoholic cirrhosis of the liver in a boy, aged four years.

TALMA OPERATION. Crede² believes that the Talma operation for cirrhosis of the liver is worthy of more general performance than it has attained. In some of his earlier cases he did not have very satisfactory results, but subsequently, performing the operation strictly according to Talma's directions, he has attained results which are most gratifying.

Tumors of Liver. An interesting case of tumor of the liver, in all probability carcinoma, is reported by Borchardt.³ The remarkable feature of the case is that there was present a spontaneous levulosuria. According to Borchardt, this constitutes the only case on record in which levulosuria was manifested without levulose having been administered.

A primary "bile-producing" carcinoma of the liver is reported by Weber.⁴

Paratyphoid Cholecystitis. The role of typhoid bacilli in the etiology of cholecystitis and cholelithiasis has long been recognized. The paratyphoid bacillus, however, has not so frequently been identified with affections of the gall-bladder. Cecil⁵ has been able to collect but six authentic cases of paratyphoid cholecystitis from the literature, and to these he adds an additional case in which the paratyphoid bacillus was cultured from both the gall-bladder and one of the stones which it contained.

Genesis of Gallstones. Schade,⁶ in his studies on the genesis of gallstones, divides them into three types—pure cholesterine stones, bilirubin-calcium stones, and pigment-calcium-cholesterine stones. Pure cholesterine stones, he concludes, usually result from the precipitation of the bile cholesterine as a result of simple stasis. The other two forms, however, result from more or less catarrhal inflammation of either chemical or bacterial origin. The various components of gallstones are frequently arranged in a layer-like formation. For instance, it is not uncommon to find the central portion of a stone to be composed of pure cholesterine and this to be surrounded by a shell of cholesterine and calcium salts. Such a formation suggests that there was at first simple biliary stagnation, that as a result of this a cholesterine stone formed and the latter produced a certain amount of catarrhal inflammation of the gall-bladder.

Appendicitis as Cause of Biliary Diseases. Weber⁷ suggests that appendicitis may be a more frequent cause of cholangitis, cholecystitis, and cholelithiasis than it is usually recognized to be. He thinks that

¹ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 8, p. 245.

² Berliner klinische Wochenschrift, 1910, No. 18, p. 813.

³ Münchener med. Wochenschrift, 1909, No. 25, p. 1278.

⁴ Lancet, 1910, No. 4520, p. 1066.

⁵ Arch. of Int. Med., 1910, vol. v, No. 5, p. 510.

⁶ Zeitschr. f. exp. Path. u. Therap., 1910, Bd. viii, Hft. 1, p. 92.

⁷ Mitteilungen aus den Grenzgebiet. der Med. u. Chirurg., 1910, Bd. xxi, Hft. 5.

the excretion by the liver of inflammatory or toxic substances carried by the blood stream from the appendix to the liver may be responsible for these conditions, but presents very little evidence of a convincing nature in support of his view.

Torsion of the Gall-bladder has occasionally been assumed to be the cause of attacks of biliary colic. Such a condition was apparently responsible for the attacks in an interesting case reported by Buch.¹ At operation the gall-bladder was found to be completely filled by two large stones so faceted as to be explainable only on the basis of torsion of the gall-bladder.

Spasm of Cardia and Pylorus in Cholelithiasis. An interesting case is reported by Buettner² in which, apparently as a result of cholelithiasis, there occurred reflex intermittent spasm of both the cardia and the pylorus.

Cholagogues. An experimental investigation of the value of the newer cholagogues led Eichler and Latz³ to substantiate Wörner's⁴ results in regard to "*ovogal*." Wörner's observations were that *ovogal* is well borne and that it materially increases the secretion of bile, and especially the bile salts. It beneficially influences the digestive processes and is serviceable in exciting the activity of the small intestines. Its specific action makes it especially serviceable in all acute and chronic catarrhal conditions of the liver and biliary passages, and above all in cholelithiasis. As bile increases intestinal peristalsis, Wörner also recommends it in the treatment of constipation.

In regard to "*chologen*," Eichler and Latz⁵ conclude as follows:

1. Chologen is a compound medicament, the various elements of which are present in unknown quantities. It is, therefore, more advantageous to administer the components individually and in known quantities.

2. Its content of mercury is too small for either a laxative or a bactericidal action; its principal action, therefore, probably depends upon the laxative effect of podophyllin.

3. Animal experiments show that the administration of chologen effects neither a qualitative nor a quantitative change in the excreted bile.

4. There are simpler, more effective, and less expensive medicaments than chologen.

DISEASES OF THE PANCREAS

Pancreatitis. Ochsner,⁶ considering pancreatitis from the standpoint of the clinical surgeon, concludes, in regard to chronic pancreatitis,

¹ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 1, p. 62.

² Ibid., Hft. 2, p. 184.

³ Ibid., 1901, Bd. xv, Hft. 5, p. 557.

⁴ Med. Klinik, 1906, No. 21.

⁵ Archiv für Verdauungskrankheiten, 1910, Bd. xvi, Hft. 3, p. 292.

⁶ Journal of the American Medical Association, 1910, No. 22, p. 1776.

that a clinical diagnosis of the condition is usually possible before operation, that it is practically always a complication of gall-bladder or gall-duct disease except when it follows metastatic infection, and that it is usually curable by relieving the pathological condition of the gall-bladder and ducts. In regard to acute pancreatitis, he takes the view which is becoming more and more generally adopted, that early operation greatly improves the prognosis, that it is important to reduce the trauma to a minimum in these cases, and that the important factor in treatment consists in the establishment of free drainage.

Jurist¹ reports an extremely interesting case of acute gangrenous pancreatitis. The patient was operated upon ten days after the onset of the pancreatitis and large amounts of necrotic material were removed. The patient finally made a complete recovery.

Deaver² discusses the diagnosis and surgical treatment of acute pancreatitis. He mentions that Fitz gives us the best concise statement of the classical symptoms of acute pancreatitis in the following sentence:

"Acute pancreatitis is to be suspected when a previously healthy person, or sufferer from occasional attacks of indigestion, is suddenly seized with violent pain in the epigastrium, followed by vomiting and collapse, and in the course of twenty-four hours, by a circumscribed epigastric swelling, tympanitic or resistant, with slight rise of temperature."

Deaver gives the records of six cases of acute pancreatitis on which he operated, and discusses the general features of the pathology, symptomatology, and the surgical treatment of the condition. He is in favor of the early operation only when the shock is not so profound as to constitute an alarming condition.

Treatment of Chronic Pancreatitis. Under the title of the "Surgical Treatment of Certain Cases of Glycosuria," Mayo-Robson³ considers the treatment of those cases of diabetes which are evidently secondary to pancreatitis, and as the result of his experience in the surgical treatment of these cases concludes:

1. That the early recognition and treatment of interstitial pancreatitis, or of pancreatic catarrh, by drainage of the bile ducts, and thus indirectly of the pancreatic ducts, and the removal of the cause, whether that be gallstones, duodenal ulcer, or other conditions, may be the means of averting diabetes.

2. That in certain diseases of the pancreas, even after the appearance of glycosuria, surgical treatment is well worth considering, as in a number of cases it has led to a complete disappearance of sugar from the urine, and in others to an arrest of the disease causing glycosuria.

¹ American Journal of the Medical Sciences, 1909, No. 449, p. 180.

² Ibid., No. 453, p. 829.

³ British Medical Journal, 1910, No. 2537, p. 973.

3. That every case of diabetes should be considered from its etiological point of view, seeing that certain cases of glycosuria of pancreatic origin are curable, and in others the progress of the disease may be arrested by suitable surgical methods that can be carried out with very small risk.

Fat Necrosis. An interesting result of some experimental work on fat necrosis carried out by Frugoni and Stradiotti¹ was that the transportation of the pancreatic ferments producing the fat necrosis occurs by way of the lymphatics.

Influence of Adrenalin and Pituitary Extract upon the Function of the Pancreas. Pemberton and Sweet,² continuing their experiments on the influence of adrenalin and pituitary extract upon the function of the pancreas, conclude that:

1. The inhibition of pancreatic activity by adrenalin and pituitary extract is independent of the systemic blood pressure, as shown by its persistence when the blood pressure is much below normal and by other evidence.

2. The inhibition by extracts of pituitary and suprarenal bodies also occurs when the pancreas is stimulated by its normal excitant, hydrochloric acid, in the duodenum.

3. In dogs rendered diabetic by extirpation of the pancreas, the mucosa of the duodenum remains abundant, in striking contrast to the emaciation of the other tissues; and acid extracts of the mucosa are as active as, if not more so than, those from normal animals.

4. Studies of the activity of pancreatic secretion (when excited by secretin) and of the inhibition of pancreatic flow by adrenalin in thyro-parathyroidectomized dogs have indicated no clear departure from the normal in this regard. This is probably also true of dogs the subject of thyroidectomy alone.

Diastatic Activity of Urine and Feces in Pancreatic Diseases. Recent work of Wohlgemuth³ constitutes something of an addition to our methods of functional diagnosis of pancreatic disease. His test consists in an estimation of the diastatic activity of the feces and urine. In pancreatic disease the diastatic activity of the feces is greatly decreased, while that of the urine is increased. Wynhausen⁴ does not place much reliance in the determination of the diastatic activity of the urine but substantiates Wohlgemuth's claim of the value of the determination of the diastatic activity of the feces. The diastatic activity of both feces and urine, of course, depends upon their respective content of diastatic ferments derived from the pancreas.

¹ Berliner klinische Wochenschrift, 1910, No. 9, p. 386.

² Archives of Internal Medicine, 1910, vol. v, p. 466.

³ Berliner klinische Wochenschrift, 1910, No. 3, p. 92.

⁴ Ibid., No. 11, p. 478.

Cambridge Reaction. The Cambridge reaction continues to be the object of clinical investigation, and its value as a diagnostic measure seems still to hang in the balance. Investigations, however, are more and more indicating that the test is of little reliability in the diagnosis of pancreatic disease. Of the five articles that I have seen during the last year dealing with the diagnostic significance of the test, four of them are decidedly unfavorable to the test as a means of clinical diagnosis; the one favorable contribution is that by Cambridge himself.

Russell,¹ after exhaustive use of the test in a great variety of diseases, concludes that it is one of a number of reactions in the urine which may accompany alimentary disorders, but that it has absolutely no more significance than this.

Hess² concludes that the reaction is by no means specific of pancreatic disease but that if carefully considered in conjunction with other findings it may be looked upon as a contributory phenomenon.

Schumm and Hegler,³ after exhaustive chemical and clinical investigation, are convinced that the reaction is not sufficiently reliable to justify its use as a diagnostic measure.

Boos and Harmer's⁴ studies show that the Cambridge reaction may be found in cases of pancreatic disease, but that it is also found in a variety of other conditions. They made a series of observations on patients with high leukocyte counts and did not fail to get a positive reaction in any case, regardless of its nature, in which the leukocytes were over 13,500 per cm.

Purely on the basis of the chemical characteristics of the test, Wohlge-muth⁵ believes that it can be looked upon as by no means diagnostic of pancreatic disease. This is in harmony with the view of Smolenski,⁶ who thinks that a positive reaction is dependent entirely upon the character of the diet. He demonstrated on a patient with carcinoma of the stomach in whom autopsy showed the pancreas to be entirely normal, that the reaction occurred in a typical manner whenever the patient was given saccharose to eat, and that the intensity of the reaction depended upon the amount of saccharose administered. Similar results were obtained by Herz and Willheim⁷ after the administration of dextrose or levulose. They, however, concluded that a positive reaction after the administration of dextrose or levulose, depends upon the functional integrity of the liver, for though they obtained a positive result in all cases in which this experiment was tried in which there

¹ British Medical Journal, 1910, No. 2583, p. 5.

² Deutsche med. Wochenschrift, 1910, No. 2, p. 61.

³ Münchener med. Wochenschrift, 1909, No. 37, p. 1878.

⁴ Boston Medical and Surgical Journal, 1910, vol. clxii, No. 24, p. 821.

⁵ Berliner klinische Wochenschrift, 1910, No. 3, p. 92.

⁶ Zeit. f. physiol. Chem., 1909, Bd. lx, p. 119.

⁷ Wiener klinische Wochenschrift, 1910, No. 24, p. 888.

was no liver disturbance, in five cases of liver disease they obtained a negative reaction.

Cambridge¹ reports on the results of his examination of 1500 specimens of urine derived from 1475 cases. Included among these were 13 cases of acute pancreatitis, all of which gave a positive reaction. The cases of chronic pancreatitis, he divides into those associated with gallstones or local malignant disease; those secondary to intestinal disease, and gastric or duodenal ulcer; those associated with diseases of the heart, vessels, or lungs; and those secondary to metastatic deposits. Of 264 cases of chronic pancreatitis in which gallstones were found at operation, 149, or 56 per cent., gave a positive reaction. Of 183 cases in which gallstones were in the common bile duct, 131, or 69.6 per cent., gave a positive reaction; 2 out of 8 cases of malignant disease of the common bile duct gave a positive reaction, as did also 2 cases of growth at the ampulla of Vater. Of 403 cases secondary to intestinal disease other than malignant growth, 211, or 52 per cent., gave a positive reaction. The urine was examined in 6 cases of chronic pancreatitis associated with heart disease, and a positive reaction obtained in all of them. Of 92 cases of metastatic malignant disease of the pancreas, 34, or 37 per cent., gave a positive reaction.

Cambridge further examined the urine in 4 cases of pancreatic calculi, and obtained a positive reaction in 3; 4 cases of pancreatic cyst were examined, and in 2 a positive reaction was observed. A positive reaction was obtained in 1 case of pancreatic infantilism. Of 73 cases of primary cancer of the pancreas, 24, or 33 per cent., gave a positive reaction. Of 467 miscellaneous cases, 461 gave a negative reaction. Cambridge further states that the urines from 50 presumably healthy individuals all gave negative reactions.

Cambridge believes that, on the basis of these results, he is justified in claiming, as he did when the reaction was first introduced, that it is "clinically useful." He emphasizes that he has repeatedly stated that the reaction is not pathognomonic and that it must be considered in conjunction with other laboratory tests and clinical features. It is unfortunate that in spite of Cambridge's claim that he has not looked upon his test as specific of pancreatic disease, the idea should be so generally entertained that he and others associated with him in the investigations of the value of the test considered it to be of positive diagnostic value. The test was originally adopted by the profession with the greatest enthusiasm. This enthusiasm gradually gave way to doubt of the reliability of the test, until now, as can be judged by the previous reports, it is looked upon by the majority of investigators as of little or no diagnostic value. It is remarkable that Cambridge himself should have obtained a negative response to the application

¹ British Medical Journal, 1910, No. 2583, p. 8.

of the test in such a large number of miscellaneous and normal cases as he reports in the results mentioned above. Most other observers have obtained a positive reaction in almost as large a percentage of individuals not suffering with pancreatic disease, as in those with pancreatic disturbance. This at best indicates that the reaction if it does possess any merit requires a degree of personal acquaintance with its performance and recognition which precludes its general adoption. Personally, I have no faith whatever in the diagnostic value of the reaction and believe that it will not be long until it will be totally discarded by clinicians.

DISEASES OF THE KIDNEYS

BY JOHN ROSE BRADFORD, M.D.

Arterial Hypertension in Renal Disease. Increased arterial tension is a subject of ever-increasing importance, both from the point of view of diagnosis as to its pathology, and also with regard to treatment, inasmuch as any remedial measures, to be efficient, have to be undertaken at a very early stage in the evolution of this condition. Formerly only the more severe varieties of the condition were recognized, and often at a stage when the anatomical changes in the cardiovascular system were such that but little could be done to remedy the ill effects. This is more especially the case owing to the fact that the anatomical lesions are often far advanced before the development of any very marked symptoms. The introduction of the manometer for the measurement of blood pressure has led, however, to the recognition of the earlier stages of the malady, and hence at the present time a group of symptoms is becoming recognized as associated with the mere development of high arterial pressure, without gross anatomical lesions. Further, several different varieties of high tension may be differentiated, and Elliott,¹ in discussing the whole subject, draws attention to the fact that probably three varieties of arterial hypertension may be recognized. The one that is most obvious and which has been the longest recognized is that associated with chronic nephritis. A second variety is that which occurs in relation to arteriosclerosis, and, in a third form, high tension to a varying degree may exist without the presence of obvious arteriosclerosis or chronic nephritis. High tension associated with chronic renal disease may be met with even in quite young patients, sometimes even in children, but the other two varieties are especially affections of middle life and of senility. The form of so-called primary arterial hypertension where there are no obvious signs of structural changes in the kidneys or vessels is probably far more frequent than is usually thought, and is commonly only recognized accidentally, inasmuch as the condition may be present for a long period without producing obvious ill health. It is very probable, as Elliott points out, that this variety is not really to be sharply differentiated from the arteriosclerotic form, but that it may be an initial manifestation of it, and it is probable that if it exists untreated for any length of time, the

¹ American Journal of the Medical Sciences, No. 458.

well-known cardiovascular and renal changes will develop secondarily as a result of increased tension.

One of the great difficulties in discussing the pathology of cardiovascular degeneration lies in the fact that the extent of the cardiovascular degeneration does not necessarily vary directly with the hypertension. Those cases of extreme fibrosis of the accessible arteries may be present without any very marked degree of high tension. On the other hand, instances are met with from time to time where extreme high tension is present for long periods, even years, without the superficial vessels becoming fibroid. The two conditions of arteriosclerosis and increased arterial tension undoubtedly do not necessarily vary *pari passu*, and it is, of course, possible that the two conditions are only indirectly related, and are perhaps dependent upon a common cause. Elliott suggests that it is possible that cases of marked increased arterial tension do not live long enough for the development of marked arteriosclerosis. But it would seem to be quite clear that arteriosclerosis, at any rate of the superficial vessels, is not of itself sufficient to produce high tension. Physicians have perhaps been inclined to consider the arterial system too much as a whole, and not to recognize that variations in blood pressure may be more especially dependent upon changes in particular arterial areas. The physiologist has long recognized that the innervation of arteries of different regions is very different. Thus, for example, the vessels of the splanchnic area are far more abundantly supplied with vasoconstrictor nerves than other vessels of the body, and changes in the caliber of these visceral vessels play a greater part in the regulation of the blood pressure normally than changes, for example, in the vessels of the muscles. Not only is this the case, but it may well come about that the constriction of an important group of vessels leading to an increase of arterial tension may cause the dilatation of other vascular areas merely as a result of the increased tension passively distending vessels or overcoming the arterial constriction of some other areas. This is notably the case with reference to the cerebral vessels, as it is well known in the laboratory that any heightening of arterial tension due to constriction of the splanchnic vessels leads to the dilatation of the cerebral vessels. There is a tendency to look upon arterial hypertension as always associated with general arterial constriction, but this is by no means necessarily the case, and it may well be that increased arterial tension is more especially to be correlated with constriction or diminution in the caliber of the splanchnic vessels. Considerations of this kind would tend to explain what at first sight seems so remarkable, that the state of the superficial vessels affords no certain indication either of the degree of hypertension present or of the anatomical changes that may be present in other vessels. As Elliott points out, some authors, especially Hasenfeld and Hirsch, have come to the conclusion from clinical and pathological data that

it is only when the vessels of the splanchnic area or of the aorta above the diaphragm are diseased that high pressure develops in arteriosclerosis. If these considerations are correct, two deductions may be drawn: (1) That high tension is especially associated with constriction, functional or organic, of the splanchnic area; and (2) that extensive changes of arteriosclerotic nature may be present in the arterial tree without high tension, provided the splanchnic vessels are not involved. Most authors have come to the conclusion upon clinical grounds that the prognosis is more serious in cases where high tension is present without obvious fibrosis in the arteries than in cases where extensive fibrosis is present unaccompanied by any increased tension. The two chief dangers in cases of increased tension are, on the one hand, secondary cardiac changes, and on the other, cerebral hemorrhage. The danger of cerebral hemorrhage in cases of increased tension is universally recognized, but here also the problem is complicated, inasmuch as the occurrence of the cerebral hemorrhage is really dependent not only upon the high tension but also upon the anatomical changes and the development of miliary aneurysms in the cerebral vessels. Cases may be seen from time to time where extreme high tension has been present for years and where cerebral hemorrhage may never occur. One case has fallen under the observation of the writer in which, with extreme high tension, eclamptic fits occurred from time to time with a further paroxysmal increase in the tension, and yet, notwithstanding the severity of these fits, cerebral hemorrhage never occurred, and death ultimately ensued from asthenia and cardiac complications. If high tension can be correlated especially with functional or organic changes in the splanchnic vessels, the problem still remains as to the etiology of the increased tension. The discovery of the action of adrenalin has emphasized the importance of chemical agents in the maintenance of arterial tension. And further, the fact that nicotine, adrenalin, and other poisons are capable of producing anatomical changes closely allied to those of arterial sclerosis, has naturally led to the view that this condition itself is of toxic origin, and it has been supposed that these toxins are absorbed from the alimentary canal, but their exact nature is not at present known.

Elliott is inclined to the opinion that the gradual thickening of the arteries in association with increasing age is capable of causing a slight increase in tension, and he thinks that a pressure of 140 mm. of mercury may be regarded as normal for a man of, say, sixty-five years of age; but that if the pressure normally exceeds 160 mm., and there are some signs of cardiac enlargement, the hypertension must be due to other causes than arteriosclerosis, and that the vessels are not only thickened, but also constricted, and it is probable that, in many instances at any rate, this has a splanchnic origin. Elliott draws attention to the difficulties in diagnosis which may arise in cases of high tension and arterio-

sclerosis, with reference to the question as to whether chronic nephritis is present or not. There is much confusion in literature with regard to this question, inasmuch as two very distinct varieties of renal lesion may be associated with hypertension, or even with arteriosclerosis. In the first place, there are the well-known cases of contracted granular kidney where the renal lesion is primary, and where the cardiovascular degeneration and hypertension are secondary. In these cases, the renal lesion is advanced and the case obviously a kidney one. On the other hand, there is a second group of cases in which the renal lesion is secondary, and is merely the local manifestation of widespread changes due to the arterial sclerosis and hypertension. In both cases albumin may be present in the urine, and in both cases a renal lesion is present, yet the outlook is very different, and far more unfavorable in the cases of true granular kidney than in the arteriosclerotic variety. In the former, a grave progressive lesion is present which is extremely liable to cause death, not only as a result of the cardiovascular degeneration, but also as a result of toxemia. In the arteriosclerotic variety this toxic element is absent, and to this extent the condition is less serious. Arterial tension reaches its highest degree of development in cases of chronic nephritis, and it is not very unusual for pressures as high as 300 mm. to be observed in these cases. The evil effects of high tension are, as already mentioned, most manifest in the heart and in the arteries. The arterial walls undergo thickening, and hence they become rigid and incapable of varying adjustment. This is perhaps one of the reasons why such severe cardiac effects ultimately result, and explains the great frequency of cardiac hypertrophy and dilatation. Elliott draws attention to a group of symptoms seen in the earlier stages of increased arterial tension, and he states that the earlier symptoms are nervous ones, such as irritability, depression of spirits, disturbed sleep, and such symptoms as flatulency, headache, and the more definite one of vertigo. A still more characteristic symptom is precordial discomfort and dyspnea upon slight exertion. The patient not only may suffer from increased frequency of micturition at night, but the quantity of urine voided in the night may be greater than that passed in the day, and Elliott draws particular attention to a paroxysmal flatulency, either nocturnal in its occurrence or supervening upon exertion. He draws attention to the similarity of this symptom to so-called cardiac asthma, and he thinks it is related to insufficiency of the right side of the heart. One of the most characteristic features of the dyspnea is the fact that it occurs on lying down, and Elliott thinks that this is dependent upon the contraction of the arteries leading to overdistention of the veins with blood. In the upright posture gravity tends to cause the accumulation of this blood in the most dependent veins, but in the recumbent posture gravity may tend to cause engorgement of the right heart. Functional derangements of the heart, especially tachycardia,

are frequently present in cases of high tension, and in a large proportion of cases physical examination will show that the heart is distinctly enlarged.

As regards the treatment of high tension, most authorities lay the greatest stress upon the regulation of the diet and upon general hygiene. A large number of cases of high tension are met with in patients who are large eaters, and hence very often the treatment of the condition is looked upon as one merely requiring limitation of flesh food. Elliott is of the opinion that excess of food, whether proteid or carbohydrate, is harmful, and he thinks that less strain is thrown upon the organism in obtaining the amount of nitrogen that is necessary from meat than from vegetable proteids. In many cases of high tension the patient has led a sedentary life and is often corpulent. There is another group of cases of high tension in which the patients are not large eaters but the digestive processes are not carried out efficiently, and intestinal toxemia results therefrom. Thus it may well be that a diet should be arranged for the corpulent so that they may diminish in weight, and, on the other hand, that thin nervous patients should be given a diet which may possibly lead to an increase of body weight. Thus it will be seen that it is not advisable or sufficient merely to forbid a flesh food and to allow the patient to take large quantities of vegetables, carbohydrates, etc., but that better results will be obtained by diminishing the intake of food in most cases and by insisting that it should all be of the simplest character. In some cases, more or less sudden paroxysmal increases of tension may occur, associated either with the development of cardiac or uremic symptoms, and in these varieties a still greater diminution in the amount of food and a restriction of the fluids may be necessary. Cases of this kind will often derive benefit from a diet containing considerable quantities of fruit. Elliott advises restriction in the amount of salt taken, and this is no doubt of greater importance in cases in which cardiac failure or uremic symptoms are developing, and it is a measure that may possibly be of value merely in the treatment of tension. Overexertion and overfatigue are obviously contraindicated. Gentle exercise is advisable and much benefit may be obtained by bath treatment, particularly where sweating can be induced. Saline purgation is one of the most valuable means we possess for diminishing arterial tension, and a saline purge causing two or three watery evacuations should be ordered.

There is much difference of opinion with regard to the use of dilators in the treatment of high tension, more especially in the class of cases where the high tension persists with marked arterial degeneration. There was at one time too great a tendency to treat the high tension with drugs of this class, the use of these remedies being determined simply by the actual height of the blood pressure at the moment. Such treatment as this is not advisable, since the height of the pressure

in any given case must be to some extent determined by the needs of the tissues for an efficient circulation, and it may be that in a patient in whom the pressure has been abnormally high for a considerable time, a sudden lowering may be followed by very unfavorable results. Many authors, as for example Janeway, who is quoted by Elliott, regard the high blood pressure in many cases as compensatory, and as an attempt on the part of the organism to maintain an efficient circulation through the kidney or some other important organ. According to Elliott, the treatment of high tension by vasodilators is to a certain extent to be determined by the presence or absence of associated renal disease. It is especially in these cases of high tension that injurious results have been obtained by the indiscriminate use of vasodilators. On the other hand, in the opinion of the writer, it may be advisable to use vasodilators in the treatment of high tension of renal disease where urgent symptoms are being produced, at any rate, in association with the high tension. Thus, for example, there is a group of cases in which epileptiform seizures occur with great suddenness, associated with a sudden paroxysmal increase of high tension and not necessarily accompanied by any other manifestations of uremia. In this class of cases, much benefit may undoubtedly be obtained by the use of drugs and other measures to lower tension. But it is probably unwise to use drugs to lower tension in these renal cases simply because the pressure is abnormally high. In a considerable number of instances very abnormal pressures may exist without the development of any urgent symptoms. Frequently, however, the use of vasodilator drugs fails to produce any very marked effects in lowering tension, owing to the advanced anatomical changes existing in the walls of the vessels. But in many, notwithstanding the fibrosis of the vessel wall, there is in addition an increased tonus, and this can be diminished by the appropriate use of vasodilators. This increased vascular tonus is answerable for many of the symptoms of high tension, and particularly for the more urgent symptoms produced more or less paroxysmally. Elliott draws attention to the necessity of treating this variety of high tension, which is to be sharply differentiated from the more permanent variety associated with the arterial changes. There is also a large field for the use of vasodilators in the cases of high tension unaccompanied by obvious renal disease and where in many instances marked changes, at any rate in the superficial vessels, are not present. Elliott considers that, when the rise of pressure is moderate in amount and there are no subjective symptoms, the use of drugs is unnecessary; but when the pressure rises materially above 200 mm. it is probable that sooner or later a breakdown in the arteries or in the heart will occur, and much good may be obtained by the use of vasodilators. In these cases he draws attention to the usefulness of giving $\frac{1}{100}$ grain of nitroglycerin to observe the degree of response obtained, as this will afford an indication of the

usefulness or otherwise of vasodilator remedies. When this dose of nitroglycerin produces an obvious effect, nitrite of sodium may be prescribed as a routine, inasmuch as its action is relatively slow and prolonged, and thus its use is not followed by some of the unpleasant symptoms liable to occur after the more powerful vasodilators. If the trial dose of nitroglycerin fails to produce any marked effect on the blood pressure, no useful purpose will be served by the routine administration of nitrites. Elliott is of the opinion that nitrites are not, as a rule, beneficial in the treatment of the hypertension of Bright's disease. They may cause marked fluctuations in the blood pressure without any reduction in the average pressure, and the patients frequently do not derive any material benefit. According to him, nitrites are only to be used in Bright's disease to meet emergencies, and especially sudden paroxysmal increases in the blood pressure.

Another point of importance in the treatment of cases of hypertension is that the state of the heart should be carefully examined and cardiac tonics prescribed if necessary. Nitrites require to be administered with great caution in cases of hypertension where cardiac weakness and dilatation are present, and, in such cases, much better results may often be obtained by the prescribing of cardiac tonics, more especially digitalis, which may often be usefully combined with nitrites. The dangers attributed to the use of digitalis in cases of hypertension are probably exaggerated.

On clinical grounds, the iodides have long been used in the treatment of high tension, and most writers are of the opinion that they are beneficial, although there has been much difference of opinion among pharmacologists with regard to the action of iodides upon the blood pressure. The differences between the results of pharmacology and those seen in the treatment of disease in the case of iodides has led to the view that their beneficial action is perhaps more especially exercised when pathological lesions are present in the walls of the vessels. Thomas¹ has carried out a series of observations upon the effects of iodides in animals where high tension and arteriosclerosis had been produced by adrenalin. Thomas also concludes from his work that the iodides led to a diminution of arterial tension in normal animals. In the animals where cardiovascular lesions have been produced by adrenalin, the mean blood pressure was some 10 mm. higher than in the normal animal, and he found more difficulty in lowering this tension by the action of iodides than in the normal animal. He considers that this result is dependent upon the higher tension in the adrenalized animal, and also on the fact that a certain degree of cardiac hypertrophy was present. The resemblance between the lesions produced by adrenalin experimentally and those of arteriosclerosis in man is considerable, but the

¹ *Revue Médicale de la Suisse Romande*, July, 1910, No. 7.

two conditions are really distinct, inasmuch as in the arteriosclerosis of man the lesion is very much more widespread. Further, as Thomas points out, it is probable that in the early stages of high tension in man a functional condition alone is present, and the iodides may produce greater effects on this than on the cases where organic lesions are well developed. On the other hand, where the hypertension is associated with renal disease, Thomas is of the opinion that neither the nitrites nor the iodides are of much avail, inasmuch as he regards the increased tension as in part dependent upon a retention of toxic material, and the treatment, therefore, should be directed not so much to the lowering of tension as to the promotion of increased elimination.

Albuminuria. The correct interpretation of albuminuria is still very often a matter of great difficulty, and perhaps the tendency, on the whole, is to attach an exaggerated significance to its presence, and not to recognize that in a very large number of instances the presence of albumin in the urine is not indicative of serious renal disease. Many criteria have been relied upon in order to attempt to differentiate between the serious and the trivial varieties. Thus, some authors have laid great stress upon intermittence as indicative of trivial disorder, the influence of posture, of diet, etc. But the progress of knowledge has shown that, as a rule, accurate conclusions cannot be drawn from the consideration of some single phenomenon such as this. Thus, for example, intermittent albuminuria is not only seen in the so-called cyclical cases where no evidence of organic disease can be elicited, but it is also not uncommon in certain stages of recovery from acute nephritis. Great individual variations in the amount of albumin may be seen from time to time in such cases and the albumin may even temporarily disappear. So-called cyclical albuminuria has also been described in the initial stages of interstitial nephritis, and, according to von Noorden,¹ such cases may be the sequel of attacks of nephrolithiasis in young persons, and he is of the opinion that when intermittent or cyclical albuminuria is found in cases of renal colic after the hematuria has subsided, this is an indication of the development of granular kidney. The introduction of the centrifuge in the routine examination of the urine has also shown that casts may be present in cases in which the albumin is not of serious moment, and that, therefore, the mere presence of casts has not the diagnostic significance formerly attributed to it. They may be seen, for example, in the albuminuria following severe exertion, and although hyaline casts are those most frequently present, yet finely granular casts, and even blood casts, may be present in association with the albuminuria of violent exertion. On the other hand, coarser granular casts, waxy casts, and fatty casts afford clear evidence of the existence of nephritis. On the other hand, in granular kidney

¹ *Wien. med. Woch.*, October 21, 1910.

the casts may be few in number, or even perhaps absent from time to time, and hence the absence of casts is not sufficient to exclude the diagnosis of serious organic disease. The greatest difficulty in practice arises in the attempt to distinguish between the harmless albuminuria and that dependent upon the early stages of some variety of chronic nephritis. The most certain means of distinction undoubtedly is that afforded by the state of the cardiovascular system. If the heart or vessels present distinct signs of morbid change, functional albuminuria must necessarily be excluded. Further, in the harmless varieties of albuminuria the blood pressure is not raised, and this affords an earlier means of recognizing chronic renal disease, inasmuch as the tension may be raised prior to the development of obvious physical signs of a cardiovascular disease. Some assistance may sometimes be afforded by observing the rapidity with which certain substances, such as methylene blue or urea, are excreted, and if there be much delay in the excretion of a moderate dose of urea, the probability of the presence of renal disease is very great. Von Noorden recognizes two forms of harmless albuminuria in the young. One is the well-known form of typical orthostatic albuminuria, the characteristics of which are well recognized. But he also recognizes another form, also occurring in the young where there is usually only a small trace of albumin which is constantly present. The patients are usually weakly, sometimes chlorotic, and present signs of slight cardiac dilatation; the urine often contains a large amount of oxalates. The albumin is readily perceptible with acetic acid, and the blood pressure is often rather below than above the normal, and a few renal elements may be present. The causation of this variety is unknown. Possibly it may be associated with the oxaluria. At any rate, it forms a clinical type and is of no very great significance.

One of the most important, and at the same time least recognized forms of albuminuria, is that which is liable to persist after an attack of nephritis. It is not sufficiently recognized that all persistent albuminuria, subsequent to an attack of nephritis, is not necessarily due to a chronic progressive lesion of the kidney. In some instances, an albuminuria of this type may last for a great number of years, and cases have fallen under the observation of the writer in which such an albuminuria, considerable in amount, persisted for twenty years or even longer without any other signs of renal disease, and without any impairment of the general health. Von Noorden has also drawn attention to this variety of albuminuria, and he also points out that it is exceedingly likely to be erroneously diagnosticated as dependent upon chronic nephritis. In most cases the amount of albumin is small, but this is by no means always the case, and sometimes the quantities voided are quite considerable. It is not uncommon for this albuminuria to be discovered more or less accidentally owing to examination for

life insurance, and it is perhaps especially in this class of cases in which symptoms are completely absent that the most serious error of diagnosis is likely to be made, especially if the amount of albumin is considerable, as such cases are then extremely apt to be diagnosticated as serious and due to chronic nephritis. Unless the case has been under observation for a considerable time such a mistake is almost unavoidable, as the harmless character of the albuminuria cannot very well be positively asserted unless it is known to have been present for a considerable time without the development of any secondary cardiovascular changes. This variety of albuminuria might be termed a residual albuminuria, inasmuch as it follows an attack of nephritis, and is certainly one of the most important forms of so-called harmless albuminuria. Von Noorden also recognizes three other forms of albuminuria which are more or less harmless in themselves. He describes an albuminuria in the early stages of pulmonary tuberculosis, and although this may, in some instances, be followed by the development of chronic nephritis, it more often clears up without the development of edema or any other symptom of renal disease. This albuminuria is presumably due to a transitory nephritis accompanying the tuberculous infection and resembles, therefore, the transitory nephritis which is so often seen during the course, and especially the early stages, of acute infective processes. Von Noorden also recognizes a more or less harmless form of albuminuria as a complication of diabetes, but here the difficulties of diagnosis are also considerable, inasmuch as many serious renal complications are apt to occur in this malady. Thus, acute nephritis, chronic parenchymatous nephritis, all of them formidable, may all occur in the course of diabetes. But over and above these, albuminuria may occur and persist for many weeks and subsequently clear up. Here also the amount of albumin is usually small, but occasionally cases are seen in which very large quantities are passed without the development of dropsy or of any other signs of serious renal disease. Von Noorden is of the opinion that the presence of this form of albuminuria should not lead to any modification in the usual dietetic treatment of diabetes, and that the albuminuria is most likely to diminish or to disappear *pari passu* with the diminution of the glycosuria and the improvement of the cases as a whole. This variety of albuminuria is important to recognize, inasmuch as the occurrence of this complication in diabetes is usually looked upon as of very serious import. Lastly, the albuminuria of granular kidney in its senile variety is also comparatively harmless, and, provided the patient submits to restrictions of diet, the progress of such cases is slow, and the albuminuria does not necessarily add to the gravity of the prognosis.

The diagnosis of these more or less harmless varieties of albuminuria, especially the juvenile types, and the form described above as residual, has, of course, a most important bearing upon the treatment. Much

harm is done by treating these cases as instances of serious renal disease, by confinement to bed, absence of exercise, and rigid diet, as thereby the general health is lowered, and the patient is often converted into an invalid. If the diagnosis can be made with confidence, such cases should be treated with an ordinary nourishing diet and systematic exercises.

Schreiber¹ draws attention to the fact that abdominal palpation, as commonly performed in the routine physical examination of patients, may cause sufficient disturbance of the renal circulation to set up a transient albuminuria, and he is of the opinion that this is most apt to occur when pressure is applied in palpation on the aorta at the level of the origin of the renal arteries. The albumin may appear in the urine within five minutes of the application of the pressure. Schreiber is of the opinion that the urine only becomes albuminous after the pressure has been removed, and that it is dependent upon a lowering of the general renal blood pressure. It is probably similar in its origin to the albuminuria that has been obtained experimentally by pressure on the abdominal aorta and on the renal arteries.

Infection of the Urinary Tract with the Colon Bacillus. The clinical picture produced by infection of the urinary tract with bacillus coli is now recognized as apt to be very variable, owing to the fact that in some instances the constitutional symptoms of general infection are so marked and there is but little to attract attention at first sight to the urinary tract. In other cases the local phenomena are so well marked that little difficulty is experienced in diagnosis. Charles² records a series of cases, and Billings³ deals more especially with the treatment of the condition by vaccines. According to Billings, the colon bacillus is present in at least 50 per cent. of all cases of bacilluria, and in most instances the patient complains of marked urinary symptoms, more especially frequent and painful micturition accompanied with an acid urine and a moderate degree of pyrexia. The increased irritability of the bladder is often attributed to the acidity, but it is more probable that it is directly dependent upon the presence of the bacillus coli. The infection is much more common in females than in males, but in many instances the onset is marked with very much more severe symptoms, as for example, repeated rigors together with severe pain, vesical, lumbar, or, as Charles and others have pointed out, not uncommonly subcostal. The sudden onset, together with the presence of subcostal pain, or lumbar pain, not infrequently leads to the erroneous diagnosis of pneumonia, especially in children. Commonly this error can be avoided by observing the absence of any physical signs of a pulmonary complication, and the presence of distinct renal tenderness,

¹ Deutsch. Arch. klin. Med., Leipsic, 1909.

² Bristol Medico-Chirurgical Journal, March, 1910, No. 107.

³ American Journal of the Medical Sciences, No. 458.

first on one side and then on the other. There is much to be said in favor of the affection being an ascending one. Thus, for example, the more frequent incidence of the disease in women, and its close association with pregnancy and other conditions, where there may be stagnation of urine in the ureters. Still, many writers are of the opinion that it may arise as a result of a blood infection, and there is much to be said in favor of the view that disturbances of the gastrointestinal tract may render the intestinal wall pervious to the organism, which is then carried by the blood to the kidney. Colon bacillus infection of the urine sometimes exists with other urinary infections, as for instance tuberculosis. Billings points out the important point that a chronic infective arthritis, so-called muscular rheumatism, neuritis, may be associated with this urinary infection, and there can be but little doubt that a large number of cases of so-called chronic rheumatism are really dependent upon an infective arthritis of urinary origin. He also draws attention to the necessity of carefully examining all cases of bacillus coli infection in order to determine with certainty whether there is any other primary focus of infection; in other words, that the colon bacilluria may sometimes be the sequel or result of some other local infection. Charles is of the opinion that in the treatment, urotropin and helmitol are decidedly useful, and he has seen the symptoms much alleviated by the administration of these drugs. Intestinal antiseptics have not been of much avail. An anticolon serum has sometimes been used with success, and there is much difference of opinion as to the value of vaccine treatment. In many cases this is followed by temporary improvement, but relapses are prone to occur. Billings is of the opinion that distinctly beneficial results are obtained with a properly carried out vaccine therapy, and most writers are agreed that citrate of potash in large doses, and more especially in children, is of great value.

Experimental Nephritis. The experimental study of nephritis has now so far progressed that not only can different varieties of nephritis be produced by the action of different poisons, but the physiological reactions of the kidney damaged by the experimentally produced nephritis can be studied, and so far a sure foundation, for the correct interpretation of the clinical phenomena of nephritis, can be laid. Such observations open up a wide field, since not only can the functions of the kidney affected with nephritis be more accurately determined, but also it is probable that future work will throw much light on the action of drugs in nephritis. Valuable results might thus be obtained with reference to the therapeutics of renal disease, a subject which urgently requires investigation at the moment when we consider the differences of opinion that exist in regard to the action of remedies and even of diet in nephritis. Pearce, Hill, and Eisenbrey¹ deal with the former

¹ *Journal of Experimental Medicine*, vol. xii, No. 2.

of these problems, *i. e.*, the vascular reactions and the elimination of nitrogen in experimental nephritis, and their work consists of an amplification of the work of Schlager and his co-workers on experimental toxic nephritis. Pearce's work has been carried out on dogs, whereas that of Schlager was done on rabbits; but the dog is more suitable for investigations, having reference to the excretion of urine and also for dealing with questions relating to nitrogenous metabolism. Further, the confirmation obtained by the production of analogous results in the dog to those obtained in the rabbit, permits of the conclusions being considered of still more widespread application, and probably that they hold good for all animals. The experimental nephritis was produced by the action of such well-known renal poisons as potassium chromate, mercuric chloride, uranium nitrate, arsenic, and cantharidin. Some of the poisons, as potassium chromate and corrosive sublimate, produce a nephritis characterized especially by lesions of the tubal epithelium, whereas others, more especially arsenic and cantharidin, produce more especially glomerular lesions. All experimental results, however, confirm the conclusions of pathological and clinical medicine that these different forms of nephritis cannot be absolutely separated from one another, and that a tubal nephritis is really a nephritis in which tubal epithelial lesions predominate rather than one in which glomerular lesions are entirely absent. Although the separation of the two varieties of nephritis is to some extent artificial, nevertheless the results of Pearce's inquiries, as also those of Schlager, show that there are very marked differences in the functional activities and responses to stimuli in these two varieties of nephritis, the glomerular and the tubal. Schlager, in his experiments on the rabbit, also used the same poisons for the production of nephritis, and he investigated the functional activity of the damaged kidney by oncometric observations and also by observations on the urinary flow. He and his associates found that the response of the kidney in which experimental tubal nephritis had been induced, to such stimuli as those produced by caffeine, sodium chloride, adrenalin, did not differ markedly from the normal in the early stages of nephritis, but that the animals eliminated a larger amount of urine than normally; he also confirmed a previous result of other workers that diuretics caused a larger flow of urine than occurred in normal animals. He, moreover, found the interesting result that the vascular reactions only differ from the normal in degree and, more especially, that the power of the renal vessels to contract or dilate in response to chemical stimuli was increased to some extent. In other words, they found that in the early stages of a tubal nephritis with marked anatomical changes and albuminuria, casts, etc., there was no evidence of any serious injury to the glomeruli as tested either by anatomical or physiological methods. In the later stages of tubal nephritis, however, the result is different, as then the kidney vessels lose their power of dilating in response to suitable

stimuli and the quantity of urine excreted also undergoes a decrease; further, at this stage slight anatomical changes may be found in the glomeruli. Schlayer found, however, that the vascular reactions were much altered when the nephritis had been induced by arsenic or cantharidin, and when, therefore, it was of the glomerular type. In this form, the power of the vessels to contract or dilate in response to stimuli became much less, and the flow of urine was also greatly diminished; the polyuria of tubal nephritis being absent. Schlayer's results may be shortly summarized as showing that, in the early stages of a tubal nephritis, there is no evidence of vascular disturbance beyond an increased flow of urine and a more ready and heightened response to vascular stimuli, and that in a glomerular nephritis the vascular reactions are greatly lessened in amount, and that there is much diminution in the quantity of urine excreted. In the later stages of a tubal nephritis the condition produced approaches more closely to that seen in glomerular nephritis. Pearce, as already stated, carried out his observations on dogs, and he tested the response of the renal vessels by using adrenalin to produce contraction, and caffeine or sodium chloride to produce dilatation or diuresis. Tubal nephritis was induced either with potassium chromate, corrosive sublimate, or uranium nitrate. The results in the early stages were briefly as follows: Polyuria occurred as an initial phenomenon and the vascular reactions were either normal or exaggerated. Caffeine and sodium chloride produced not only marked vascular dilatation, but also a correspondingly large diuretic effect. These results were obtained not only on the first day of the induced malady, but also on the second, and in some instances as late as the third day. Pearce regards these results as due to a functional disturbance of the glomeruli, since there is no evidence of any gross anatomical lesion, and that this functional disturbance is of the nature of an increased excitability. He draws attention to the interesting fact that somewhat similar results may be seen in cases where arsenic or cantharidin is used in doses too small to produce serious vascular effects, and, hence, it is possible that these results in the case of tubal poisons may be due to these poisons having a slight irritant action on the glomeruli. In confirmation of this he finds that an epithelial poison, like potassium chromate, when injected into a normal dog causes a distinct diuretic effect, and thus the increased excitability of the glomeruli would seem to be really independent of the tubal injury. In the case of nephritis of the glomerular type produced by arsenic, for instance, the results of the action of such a drug as caffeine is very different, since it only produces a minimal dilatation unaccompanied by any efficient diuresis, and, further, adrenalin produces also only a minimal constriction of the renal vessels. Similarly, in the case of cantharidin nephritis, the vessels react to a greatly diminished extent in response to stimuli, and temporary anuria is very readily induced. The conclusion arrived at

from contrasting the results of the action of epithelial and glomerular poisons, respectively, is that these poisons do not produce exclusively vascular or epithelial lesions as the case may be, but rather that one or other of these two results predominates in any given case, and this is in entire accord with the results of clinical and pathological experience. In the later stages of tubal nephritis somewhat different results were obtained by Pearce. He found that the renal vessels have then a greatly diminished power of dilating in response to caffeine, and that diuresis either cannot be produced at all or only in a very slight degree. This anuria may be accompanied with marked gastro-intestinal disturbance, but this is not invariably the case, but this anuric type is especially seen in animals presenting the more severe symptoms. In most cases of tubal nephritis, however, polyuria, together with general weakness and no marked gastro-intestinal phenomena, are the prominent effects. Pearce draws attention to the remarkable fact that this polyuria ceases as soon as the animal is anesthetized, and curious enough this anuria may occur at a time when the vessels are still capable of dilating under the influence of caffeine. This drug, however, fails to produce any accompanying diuresis, notwithstanding the fact that the vascular dilatation may be quite comparable in amount to that usually seen as the result of its action.

As regards the elimination of nitrogen, Pearce found that in tubal nephritis, especially that produced by uranium, its excretion was considerably diminished and the occurrence of gastrointestinal disturbances appeared to take a definite relation to the retention of nitrogen, but as there was no evidence of any increased elimination of nitrogen by the feces, the gastrointestinal disturbance cannot be explained by any theory of vicarious excretion of nitrogen by the bowel. In the other type of nephritis, such as is produced by arsenic, there may be a great increase in the amount of nitrogen excreted in the urine, and this is presumably dependent upon the increased metabolism produced by the arsenic. This result is of interest as showing that quite a severe vascular or glomerular nephritis may be produced by arsenic and yet the epithelium of the tubules may remain in a condition capable of excreting large amounts of nitrogen quite comparable to, or greater than, the quantities excreted normally. All these experimental results are of interest to the clinician and aid him in interpreting the complex picture presented by renal disease in the human subject. A great advance would be made if it were possible from the symptoms to diagnose the relative degree of involvement of the epithelial and vascular elements of the kidney in cases of nephritis, as many questions of treatment and of prognosis must ultimately be decided in this way, and work of the kind summarized above marks an advance in this direction.

Composition of Urinary Calculi. Mackarell, Moore, and Thomas¹ have conducted a series of analyses of the composition of urinary calculi.

¹ Biochemical Journal, vol. v, No. 4.

They have examined a series of 24 renal calculi taken indiscriminately in the course of surgical practice and being in no way a selected series of cases. In 1 case the stone was of prostatic origin, and in 2 cases vesical, the remaining 21 were obtained either from the kidney or, as in 6 cases, from the ureter. In the course of the analysis the following determinations were made: the quantity of moisture, the amounts of calcium oxalate, calcium phosphate, uric acid and the total nitrogen present, this being estimated by Kjeldahl's method. The determinations of total nitrogen were made more especially as a control of the uric acid estimations, the actual quantities of uric acid observed being compared with the quantities calculated on the hypothesis that all the nitrogen present was in form of the uric acid. The records of the two series of observations were remarkably concordant, showing that the methods used were sufficiently accurate to satisfactorily determine the amount of uric acid present and that no appreciable quantity was overlooked. The results obtained by the authors are of interest from the point of view of the etiology of renal calculus, as their results show that, contrary to the usual opinion, uric acid is not the most common constituent of renal calculi, and that calcium oxalate and calcium phosphate are much more frequently present. Thus, in the series of 24 calculi, only 2 consisted of pure uric acid, and in both cases these calculi were vesical; in neither of them was any trace of calcium present. In all the others, calcium oxalate was present in large amount, in only one instance to a less extent than 30 per cent. and in more than two-thirds of the cases calcium oxalate was present to the extent of 70 per cent. or more of the total weight of the calculus. The next most abundant constituent was tricalcic phosphate, and this insoluble calcium salt was present to the extent of 5 per cent. in 4 renal calculi, and in 5 others it was present in quite appreciable amount. As regards uric acid, omitting the two vesical stones, the quantity present only reached 10 per cent. in 4 out of the 22 stones, and in many it was not above 2 or 3 per cent. The authors are of the opinion that the contrast afforded by the 2 vesical calculi where the uric acid was present to the extent of 97 per cent. and 98 per cent., respectively, was so great as to suggest that possibly these stones had a totally different origin and were primarily vesical and not renal in origin. The fact that the great majority of renal calculi contained relatively little uric acid, but, on the other hand, large quantities of calcium oxalate and phosphate, raises many questions in the etiology and the treatment of the condition. The authors point out that the presence of the incompletely oxidized oxalate suggests a disturbance of metabolism in which either embarrassed oxidation or increased reducing actions are the main factors. The formation of such a calculus might be due to the production of oxalic acid under pathological conditions, and, inasmuch as calcium oxalate is so very insoluble, a precipitation leading to the formation of a calculus

might take place around any available nucleus produced by some local lesion in the renal pelvis. The fact, however, that the oxalate is so frequently associated with large quantities of calcium phosphate tends to show that the question is not so simple, and this fact tends to support the view that the faulty metabolism giving rise to the excess of oxalic acid also causes an excess of phosphoric acid. It may be that a faulty metabolism of the proteids containing purin bases is answerable for both the excess of oxalic and of phosphoric acid, since the latter might be derived from the metabolism of nuclein. On the other hand, it may be that an erroneous metabolism involving the late calcium may be a more important factor in the production of calculi than questions concerning the production of oxalic, phosphoric, or uric acid. The authors point out that many pathological processes associated with deficient oxidation lead to the deposition of calcium salts in an insoluble form, as for instance, the calcareous deposits seen in tuberculous affections and the calcification associated with arteriosclerosis. If this should prove to be correct, it may be difficult to control calcium metabolism by therapeutic measures, inasmuch as calcium is contained in all common foods, and some foods, *i. e.*, milk, are very rich in calcium. More success might perhaps be obtained by attempting to alter the reaction of the plasma and so diminish the excess of calcium oxalate and phosphate. The authors lay stress on the fact that to produce this effect quite opposite methods would have to be employed to those at present in use in the treatment of the so-called uric-acid diathesis, since uric acid tends to be dissolved by alkalies, whereas calcium oxalate and phosphate tend to be deposited by alkalies, and dissolved by acids. It is quite hopeless, viewing the insolubility of calcium oxalate calculi, to attempt to dissolve them by such treatment; the most that could be expected is that suitable treatment might prevent their formation, or their re-formation, after any calculi present had been removed by operation. The dietetic and medicinal treatment of these patients after operation is of the utmost importance, and for this to be carried out efficiently, it is essential that all calculi should be analyzed after removal.

SURGERY OF THE EXTREMITIES, SHOCK, ANESTHESIA, INFECTIONS, FRACTURES AND DISLOCATIONS, AND TUMORS

BY JOSEPH C. BLOODGOOD, M.D.

INJURIES

Most surgical diseases are results of injuries, infections, or tumors (neoplastic formations).

With each of these conditions—injuries, infections, and tumors—there is a local and, as a rule, a general effect. The local effect of the injury is some form of a wound. The general effect we call shock. In infections, the point first involved is called the portal of entrance or the primary lesion, while the general effect may be defined by the term septicemia or general infection. Tumors are, in their onset, distinctly local growths, but with the malignant tumors there is very soon a general dissemination of the specific cells and a general effect probably due to toxins.

In the surgery of the extremities it is interesting to critically review the literature along these lines, following them a little more closely than in previous contributions.

The results of an injury are, therefore, the wound and the shock. There is an immediate general effect of a trauma, and, as a rule, the term shock applies in general to this condition, but we must also bear in mind later effects which vary in their manifestations. The condition is usually called traumatic neurosis.

I will also attempt to illustrate the immediate and remote effect of the local wound. In the immediate effects of a wound we are interested in hemorrhage, the prevention of infection, the healing of the wound, the diseases which apparently have some definite relation to trauma, and the scar tissue following the healing of a wound.

Shock. This surgical disease has been discussed so frequently in these pages that it is unnecessary to define it. Each year the medical profession, not only the surgeons, are having their attention called more and more to shock.

ANATOMICAL BASIS OF SHOCK. Crile¹ and Dolley² are the first to attempt an explanation of shock on a distinctly anatomical basis

¹ *Annals of Surgery*, 1910, vol. li, p. 753.

² *Journal of Medical Research*, April, 1909, vol. xx, p. 275.

and claim that they have found definite changes in the Purkinje cells of the cerebellum of shocked dogs which, they think, is due to the shock alone.

They are also of the opinion that they can, to a certain extent, estimate the degree of shock by the changes in these cells.

Whether these investigations of Crile and Dolley be accepted or not, we owe to both of these investigators a clearer conception of the condition which has allowed a much more rational treatment.

It is important to remember that, with certain diseases, sudden death may take place upon very little or no provocation. When such a patient receives an injury, or is anesthetized, or is subjected to an operation of some kind, sudden death may take place, and this may be attributed to shock. These cases, to a certain extent, must be eliminated. However, it is very important for both surgeon and physician to be able to estimate the general condition of the patient and the presence or absence of certain organic diseases. It is unusual to observe death from shock, either operative, traumatic, or anesthetic, in an individual with healthy organs if there is no loss of blood. The strongest individual will succumb to hemorrhage, but it requires an unusual degree of injury to be fatal in such an individual.

Every condition of the tissues or organs which lowers the patient's resistance to the factors which produce shock and to hemorrhage may be looked upon as a handicap if such an individual receives an accidental injury, or is subjected to operation or anesthesia. These patients are well called handicapped. In the third group we have those with a lesion which at any moment may produce sudden death. To this group the term *noli me tangere* may be applied.

As a matter of fact, the normal individual today gives the surgeon very little anxiety as regards shock, and we are all chiefly concerned with the handicapped group, and how to diagnose the third group.

SUDDEN AND UNEXPECTED DEATH. The review¹ of W. M. Wynn Westcott's² article on this subject is so good that it seems worth while presenting it here in full.

In estimating a case of sudden death the importance of the autopsy has perhaps been exaggerated, since in many cases the existing malady can be established, but rarely the cause of sudden death. It is still unknown, for instance, how great a loss of blood man can withstand, or how large portions of the brain may be destroyed by softening and hemorrhage, while, on the other hand, a stab in the region of the fourth ventricle or in the medulla oblongata causes instantaneous death. And likewise, angina pectoris may be the cause of sudden death, while the autopsy only reveals valvular lesions. Pressure upon a healthy testicle

¹ Zentralbl. f. d. Grenzgeb. d. Med. u. Chir., 1909, xii, 189.

² British Medical Journal, February 29, 1908.

may kill one individual under certain conditions, while another may continue to live for years with a carcinoma of the testis. Epilepsy, too, may suddenly bring about death.

A tabulation showed that sudden death was due to some disease of the heart in 60 per cent.; to disease of the brain in 30 per cent., and that it was attributable to the lungs in 10 per cent. of the cases.

Death from Hemorrhage. Here we have *external hemorrhages*—hemoptysis, hematemesis, rupture of an aneurysm, epistaxis, rupture of a varix, intestinal hemorrhages and menorrhagiæ, hemorrhages from the kidney and bladder. *Inner hemorrhages*—placenta prævia; extrauterine pregnancy; aortic aneurysm; rupture of the spleen, pancreas, liver, kidney; intestinal perforation; rupture of the stomach.

Death from Heart Disease. The cause of the cardiac malady is, as a rule, acute rheumatism, scarlatina, or fatty degeneration. The most frequent to end with sudden death are affections of the aortal valves; after these, those of the mitral valves; less frequently of the pulmonary and tricuspid valves. Angina pectoris causes death, through sudden shock, which is a not very infrequent cause in rupture of the heart and general atheroma of the thoracic arteries. Other circumstances bearing upon sudden death under this heading are: Sudden applications of large quantities of cold or hot water, changes in blood-pressure in punctures or rapid evacuation of an overdistended bladder by a catheter. Most frequently, sudden death ensues in fatty heart due to chronic alcoholism, especially during an attack of delirium tremens. Immediate fright, fear, or excitement, as well as an unexpected trauma to the testicle or the epigastrium, are known to have caused sudden death; likewise exhaustion following sexual excesses.

Death from Pulmonary Disease. Here we have asphyxia due to edema of the lungs; further, in purulent pleurisy by rupture into the mediastinum; compression of the vagus by an aneurysm; edema of the glottis; edema of the lung in puerperal processes; raised atmospheric pressure in mine and caisson workers; inhalation of irrespirable gases. Asphyxia also occurs in strychnine poisoning and respiratory paralysis due to embolism. In sudden cessation of respiration, death takes place in about three minutes.

Death in Coma and Diseases of the Brain. Among the most frequent causes of sudden death is apoplexy, which, as well as tumors and abscesses, is easily demonstrated at the postmortem. More difficult to interpret are those cases in which no serious injuries of the brain, the spinal cord, or other vital organs can be found. Here we have death after convulsions of epileptic character, uremia, and diabetic coma. A rather rare cause of death is pressure of the retroverted uterus upon one or both ureters with uremia. Fracture of the base of the skull with bone depression, or cerebral compression, must be mentioned in this group.

The Kidneys and Uremia. Chronic disease of the kidney with hypertrophy and dilatation of the heart may bring about unexpected death; also *chronic gout* following disease of the kidney leads to hypertrophy and dilatation of the heart, and the sudden disappearance of an acute gouty inflammation is known to have been followed by sudden death. *Addison's disease* frequently ends very abruptly; in children we must bear in mind the so-called *thymus death*.

Convulsions from Various Causes. Here we have epilepsy, the period of first dentition, laryngospasm, croup and diphtheria, cholemia in the course of jaundice, acetone in the blood of diabetics, edema of the glottis, and swallowing of foreign bodies.

John B. Blake,¹ of Boston, is one of the first American surgeons to call the attention of the American Surgical Association to this important question of sudden death, and to the question whether surgeons by the most careful routine examination can ascertain the presence of any conditions apt to lead to sudden death. Blake's conclusions are as follows:

In endeavoring to guard against sudden death we must remember:

1. The comparative frequency of status lymphaticus. At least, eight cases have come to medicolegal autopsy as the result of sudden death in Boston within the past year, and in the experience of only two medical examiners. Another has been withheld from operation by the skilful diagnosis of a physician; another died shortly after a simple circumcision. It is believed that the diagnosis can often be made in advance by attention to the possible presence of a thymus, bowing of the femurs, a thick, short neck, and, in men, pubic hair of the female type. Of the eight cases upon which autopsy was done, six died almost instantly, and two some hours after a slight injury was received.

2. The invariable necessity for a more thorough and complete physical examination and personal history before operations even of a minor character.

3. The importance of diminishing to a minimum preanesthetic fright, apprehension, and intense emotion for the sake of the patient's safety as well as comfort. (Dr. Crile has reported an admirable method of doing this in thyroid cases.)

4. The very great importance of complete histories and autopsies in every case of sudden death, an end which can be best attained by securing the active coöperation of medical examiners and coroner's physicians.

5. The necessity of the careful report of every case of operative sudden death, even if no autopsy is obtained, by the surgeon in charge of the case. It does not seem essential that such reports should be originally

¹ *Annals of Surgery*, 1909, vol. 1, p. 43.

presented to the world at large, but they might well be made to a small committee of this Society and by them examined and analyzed, and the essential facts brought to the attention of the medical public.

Dr. Blake would greatly appreciate any notes of sudden deaths of the character above described, which have occurred under the observation of the members of the American Surgical Association.

WOUNDS

The most dangerous immediate effect of a wound is *hemorrhage*. This leads to the recent progress in the treatment of hemorrhage, and in the diagnosis of latent hemorrhage. Today the accepted treatment for loss of blood in a moderate degree is the introduction of salt solution by the rectum, subcutaneously or intravenously, according to the urgency of the case. In more grave anemias blood transfusion by some form of arteriovenous anastomosis should be done. This operation is looked upon as life-saving.

The technique of the introduction of saline solution is well established, and there is no new important literature upon this subject. There are a number of modified methods of giving saline solution per rectum by the so-called drop method of Murphy.

There is some recent literature in regard to the dangers of large quantities of salt solution in certain conditions, and some suggestions to modify the usually employed isotonic normal salt solution.

There has been no improvement offered to Alexis Carrel's method of arteriovenous anastomosis, but there have been a number of cannulæ suggested as a substitute for Crile's.

The problem of hemorrhage and its treatment must also embrace the recognition of diseases in which hemorrhage is a symptom and in which any wound will bleed, perhaps fatally.

The problem is, Can such a disease be recognized, and is there any treatment which will prevent hemorrhage from a wound, or, if bleeding has taken place, are there any means for increasing the coagulation of blood? In surgery today we most frequently meet with this sort of hemorrhage in jaundiced patients. Hemophilic individuals are not common in the surgical clinic, but one must be on the lookout for them. Then there are a few diseases in which hemorrhage takes place spontaneously. For example in *melæna neonatorum*, which, as a rule, has hitherto been fatal, arteriovenous transfusion, and the human or animal serum have saved life.

The problem of hemorrhage, therefore, is a serious one, and today the methods of treatment have been made more efficacious.

With the artery clamp, blood transfusion, and animal sera to increase the coagulability of the blood we have almost every form of hemorrhage

within safe control. It must be remembered, however, that with certain individuals the introduction of blood from another human being, or the injection of an animal serum may involve the dangers of anaphylaxis.

The second problem in relation to wounds, whether accidental or operative, is the *prevention of infection* and the means employed to encourage the proper healing of the wound. This problem may be considered under the term operative technique. On this subject there is very little new or important. When a wound becomes infected, then we have a new problem in the recognition of the various infections.

Another very important problem is the relation of trauma to certain diseases—inflammatory or neoplastic; that is, the remote results of a wound.

Hemorrhage. **SALT SOLUTION.** There are four recent foreign communications on the dangers and injurious effects of subcutaneous salt infusion: Sippel,¹ Fleig,² Anton Thies,³ and Hans Hoessli.⁴

Thies, after an extended study, comes to the following conclusions: The physiological saline solution (0.9 per cent.), or any pure salt solution, is not unreservedly suitable for infusion at the sick bed. Under circumstances, it may lead to serious harm. It should especially be avoided in small children; in diseases associated with considerable loss of salts; in conditions of starvation; in cachexia; in diseases complicated by changes in the kidneys, the heart and the vascular system. In addition, it should not be employed in such diseases in which a retention of common salt, or even an increased elimination of other salts takes place, that is, in all conditions associated with fever. Further, it should be excluded in cholemia. Salt infusion should be absolutely avoided whenever larger quantities of the saline solution are to be administered.

The danger of injuring the body through the administration of common salt is the greater, the more through the substitution of sodium for the alkaline cell metals of a different kind, these alkaline metals are eliminated from the cell against the normal quantitative proportion of the metals of the cell albumin.

Since, then, potassium and calcium are among the metals essential for the preservation of the life and function of the cell, it becomes necessary to counteract their displacement from their combinations, by the presence of these metals in the infusion fluid. The quantity of the potassium and calcium salts must be selected to about correspond to that of the tissues of the body, that is, about 0.6 per cent. sodium chloride, 0.02 per cent. calcium chloride, 0.02 per cent. potassium chloride. This solution is hypotonic, but any harm that may arise

¹ Centralbl. f. Chir., 1910, xxxvii, 610.

² Ibid.

³ Mitteilungen a. d. Grenzgeb., 1910, xxi, 239. Reviewed in the Journal of the American Medical Association, 1910, vol. liv, p. 1015.

⁴ Centralbl. f. Chir., 1910, xxxvii, 658.

from hypotonicity must be considered slight as compared with that which may be inflicted upon the body through the infusion of a common-salt solution. If the solution is to be isotonic, as is probably desirable in subcutaneous administration, not only the proportion of the common salt, but also of the potassium and calcium should be correspondingly increased, so that the following quantitative proportion would be about right: sodium chloride, 0.85 per cent.; potassium chloride, 0.03 per cent.; calcium chloride, 0.03 per cent.

Hoessli found at animal experiments that there were certain changes in the cells after the intraperitoneal introduction of normal salt solution (0.9 per cent.). He found fat globules in the cells in the heart and kidney. They appeared in about six hours, were most marked at the end of twenty-four, and disappeared at the end of forty-eight hours. Loss of blood did not produce these changes, which were less when, instead of salt solution of the physiological type a solution which he calls Ringer's was employed:

	Per cent.
Sodium chloride (NaCl)	0.70
Calcium chloride (CaCl)	0.02
Potassium chloride (KCl)	0.01
Sodium bicarbonate	0.01

It will be noted that this solution lies between the iso- and hypotonic solutions of Thiess, which are as follows:

	Isotonic.	Hypotonic.
Sodium chloride (NaCl)	0.85	0.60
Calcium chloride (CaCl)	0.03	0.02
Potassium chloride (KCl)	0.03	0.02

The story of saline infusion has been quite completely told in *PROGRESSIVE MEDICINE*.¹

From my experience I would recommend the hypotonic solution sodium chloride 0.6 of Thiess, except I would reduce the calcium chloride to 0.01, if used at all. Dawson² has demonstrated the dangers of calcium chloride in larger quantities.

Clinically, I have been unable to observe any but good effects from salt solution. It is now given as a routine measure in every case per rectum (Murphy's method); we never hesitate to employ it subcutaneously for even days after operation, and, in certain cases, its employment intravenously is life-saving. However, one should be careful that the solution is not only sterile, but of the correct proportion. Intravenously, one should give it slowly, as a rule not more than 500 c.c. to 1000 c.c. at a time. We can estimate the amount administered subcutaneously by the rapidity with which it is absorbed. In all cases

¹ December, 1900, p. 107; 1902, p. 73; 1903, p. 94; 1908, p. 125.

² *PROGRESSIVE MEDICINE*, December, 1902, p. 74.

with a weak heart, or chronic bronchitis, the salt solution in any form should be given more cautiously.

In view of the results in hospital practice, I am of the opinion that the subcutaneous and rectal administration of salt solution should be tried more frequently with patients treated at home. Salt solution should be a more frequent therapeutic agent of the general practitioner.

BLOOD TRANSFUSION. Crile,¹ in reporting his further observations on transfusion before the American Surgical Association, states that he still uses his method and his own cannula. His personal cases have been technically successful and without accident. He has adopted a diminutive hook devised by Dr. Davis, of Birmingham, to draw the vessel through the cannula. He is still of the opinion that the vein, having a thinner wall, lends itself to a cuff better than the artery. He draws the vein through the cannula, turns up a cuff, and then pulls the artery over the vein. In some cases he dilates the artery with small mosquito forceps covered with vaseline and then draws the artery over the vein beyond the point of injury due to dilatation.

Crile has tables which can be lowered or elevated, and the adjustment is so accurate that the greatest comfort to the two individuals is secured. In selecting the donor, kinship is of no advantage. Obesity makes the bloodvessels less accessible. The heart should receive the greatest attention, especially in very anemic patients, because if the blood is rapidly supplied to the recipient with the heart muscle working at a maximum, there may be immediate striking improvement, but this may produce sudden dilatation. One can guard against this accident by adjustment of the rate of flow from the donor, and the condition of the heart can be watched by percussion and auscultation. Of course, it is well understood that in anemic patients the head must be low. When the heart is very weak, rhythmic compression of the chest should be employed until the circulation is established.

Crile has observed no results in pernicious anemia, toxemia, certain drug poisoning, leukemia, Hodgkin's disease, carcinoma, and uremia.

In discussing hemolysis, he makes the very important statement that "if there is hemolysis *in vitro* it by no means necessarily follows that there will be hemolysis *in vivo*." An examination, therefore, of the hemolytic action of the blood of the donor upon that of the recipient cannot be looked upon as an indication for or against transfusion.

Hubbard and Kimptom² made a comparison of the methods of direct transfusion in the laboratory of surgical research of the Harvard Medical School. They seem to be of the opinion that Crile's technique is difficult and recommend the cannula devised by Elsberg³ (Fig. 1). They also recommend the employment of the larger vessel, the vein,

¹ Transactions of the American Surgical Association, 1909, vol. xxvii, p. 80.

² Boston Medical and Surgical Journal, November 4, 1909, vol. clxi, p. 652.

³ Journal of the American Medical Association, March 13, 1909, vol. lii, p. 887.

for the outer one in the anastomosis—the reverse of Crile's technique. They do not stretch the lumen of the artery.

Brewer and Leggett¹ have devised paraffin-coated glass tubes to facilitate direct transfusion. It is their experience and opinion that there is no danger of clotting. This method of Brewer will appeal to surgeons on account of its simplicity.

In my own experience I have always employed Crile's technique successfully, and the cases which I have turned over to the residents, who had had no previous laboratory experience were equally successful.

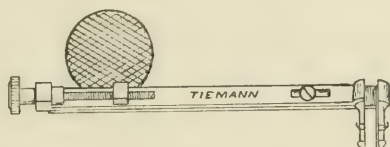


FIG. 1.—Single cannula for the direct transfusion of blood.

As to the method of direct transfusion, it makes very little difference provided it is done successfully. For very young infants Carrel's arterial end-to-end suture may be the only method possible, and in such cases considerable practice with this suture in the laboratory will be of great help.

Blood transfusion is not employed as frequently as it should be in this country.

R. T. Frank,² in view of Carrel's work on the preservation and transplantation of bloodvessels, employed the following method in dogs successfully. He carefully excised a piece of the carotid artery and, after cleansing it with salt solution and stripping it of its adventitia, attached to each end a Crile cannula; this vessel was then employed as the tube between the artery and vein. He is of the opinion that such a method can be employed in human beings, providing the carotid artery can be properly preserved.

Hotz's³ contribution from Enderlen's clinic in Wuerzburg is the first that I have met in German literature. Their experience practically corresponds with that of Crile and others in this country. In this German clinic, suture is employed, and, apparently, the few cases of thrombosis at the point of suture would suggest that their technical results are not as good as those after Crile's cannula method. With this exception and one case of hemophilia, they experienced no difficulties whatever.

Here the normal sister furnished the blood for her bleeding brother. Hemolysis evidently took place, because there was hemoglobinuria.

¹ Surgery, Gynecology, and Obstetrics, 1909, vol. ix, p. 293.

² New York Medical Journal, November 28, 1908.

³ Deutsche Zeitschr. f. Chir., 1910, civ, 603.

The epistaxis for which the boy was transfused ceased with the transfusion, but later recurred, and after the hemoglobinuria disappeared there was a spontaneous hemorrhage from the transfusion wound. The patient recovered. Crile's experience with three cases of hemophilia showed no hemolysis, immediate benefit, but later recurrence of the hemorrhage. The indication, therefore, for transfusion in the hemophilic is not settled.

In this article, Hotz mentions his interesting experiments with parabiosis in dogs: The proximal carotid of one is anastomosed to the distal carotid of the other, and the reverse of the external jugular vein; this results in a permanent exchange of blood between the two dogs, that is, one circulation with two pumps. No bad effects were observed on either dog.

SERA IN THE TREATMENT OF HEMORRHAGE. We need other means to combat hemorrhage besides the artery clamp, salt solution, and blood transfusion. Especially in patients whose blood coagulation is slow, in jaundice, hemophilia, and the various forms of purpura. Gelatin and the calcium salts have not yielded the results hoped for. Recent literature demonstrates a much more efficacious remedy—blood serum.

The danger of using a serum from the blood of some other animal is *anaphylaxis*, which may be grave in its symptoms, even fatal. The danger increases when the dose is repeated within a few days. The discomforts following the injections of the antitoxins of diphtheria and tetanus are not infrequent, and many physicians are not familiar with them. I have been often called in consultation for certain symptoms which have developed after the injection of antitoxin for tetanus. Von Pirquet, in 1905, published a monograph in German on "serum sickness." Recently it has been discussed considerably in American literature.

Leary¹ recommends the employment of rabbit's serum, which is easily obtained and is entirely free from the danger of tetanus present in horse serum. This rabbit's serum, which is injected subcutaneously, has been employed for both the prevention and treatment of certain forms of hemorrhage. Munro and Bottomley, of the Carney Hospital, in Boston, are of the opinion that the results with rabbit's serum are far better than calcium salt. Leary also reports successful cases in hemorrhage in the newborn, hemophilia, purpura, and some post-operative hemorrhages from the nose, uterine hemorrhage at the menopause, and typhoid hemorrhages.

Serum sickness, which consists chiefly of local edema, urticaria, and pain in the joints, was observed in a few cases. The serious *symptoms of anaphylaxis*, which are usually present in other sera when a

¹ Boston Medical and Surgical Journal, 1908, vol. clix, p. 73.

second injection is given after an interval of ten days or more, consist of sudden dyspnea, cyanosis, and death. Fortunately this is rare in man. Apparently repeated injections at intervals shorter than ten days are unattended by danger. In the use of rabbit serum, if repeated injections are necessary the danger of anaphylaxis must be borne in mind. If a second were indicated, Leary would employ serum from another animal like a guinea-pig, and in every instance the interval between the two injections should be distinctly within ten days. In his twenty cases, there was but one of serum sickness.

The technique of the preparation of the serum had better be left in the hands of an expert laboratory worker, although in an emergency, if one is clean, one should not hesitate to prepare it.

Human Serum. John E. Welch¹ shows from his experience that normal human blood serum is more easily obtained than animal serum; the dangers are apparently less, and the results better. He describes the symptoms of *serum sickness* as follows: There is usually irregular fever; then there are manifestations on the skin, consisting of migrating rashes and troublesome urticaria; edema is not infrequent; the itching may be agonizing; erythema may follow in two or three weeks, and there are other erythematous rashes of the skin; the lymph nodes near the point of injection may be tender; the joints may be swollen, painful, and red; the urine may show albumin, casts, and blood; there may be hemorrhages from the mucous membrane.

I have seen practically all these symptoms in a mild degree, except the hemorrhage, after the injection of tetanus antitoxin as a prophylactic measure.

Welch states that in 1906 there were 19 cases of sudden death in the literature. These symptoms and fatalities, it must be remembered, were after the use of animal serum. Von Pirquet is of the opinion that 20 per cent. of individuals receiving injections of animal serum will exhibit symptoms of serum sickness after eight to twelve days.

It was von Pirquet and Schick who first demonstrated the danger of a second injection, and the condition produced called anaphylaxis.

Welch reports his cases of hemophilia neonatorum successfully treated with injections of human-blood serum. The entire details of the technique are given in his paper, and are as follows:

"The blood is very easily collected. The apparatus (Fig. 2) consists of a rubber cork through which are two perforations. Through one perforation is fitted a U-shaped glass tube, to the outer end of which is attached, by means of a piece of rubber tubing, a short aspirating needle having a No. 19 caliber. The needle is cotton-plugged into a small test-tube, in which it is sterilized. Through the other perforation is inserted a fusiform glass tube containing cotton to prevent

¹ American Journal of the Medical Sciences, June, 1910, vol. cxxxix, p. 800.

contaminating the contents of the flask. A small suction tube is placed on this latter for drawing the blood into the flask. The needle is inserted into a vein at the elbow and the desired amount of blood withdrawn. The blood is allowed to coagulate in a slanting position in the flask and the serum is withdrawn as rapidly as it separates, and it is then ready for use. As to the dose of the serum to be used in any given case, it should be said that this depends upon the urgency of the case. One is apt to err on the side of too small doses. It is advisable to begin with at least 10 c.c. and repeat three times a day if the infant

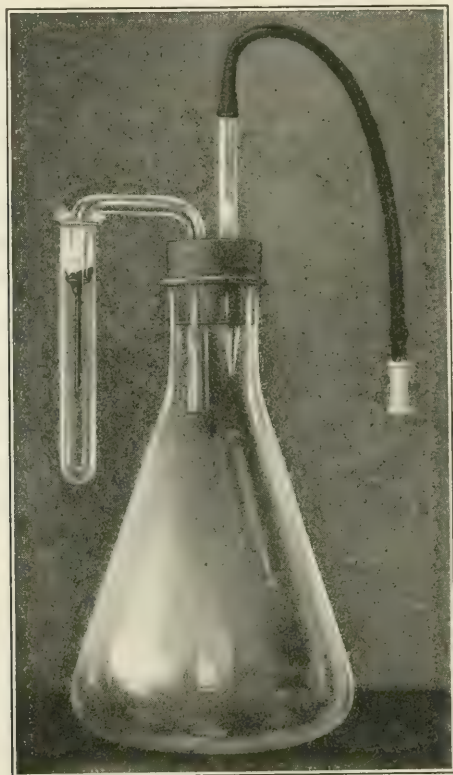


FIG. 2.—Apparatus for collecting the blood serum.

is bleeding only moderately. In severe cases it should be given every two hours and in larger quantities if necessary. It is very important to begin the treatment at the first indication of bleeding, however apparently insignificant."

John F. Anderson¹ presented before the Johns Hopkins Medical Society, in March, 1910, a very clear summary of *anaphylaxis* and its relation to clinical medicine.

¹ Bulletin of Johns Hopkins Hospital, July, 1910, vol. xxi, p. 218.

In the most recent number of the *Journal of the American Medical Association* (July 30, 1910, lv, 405) there is an editorial on this subject.

Both physicians and surgeons should familiarize themselves with serum sickness and anaphylaxis. There is no excuse today for ignorance on these subjects because American literature, accessible to all, has again and again called attention to this interesting condition.

Moss (personal communication) is now working on a cutaneous reaction which he hopes will be of value in the selection of those individuals who are unusually sensitive to the blood serum of other animals.

In view of the high mortality of hemophilia neonatorum, this treatment with human blood serum should be attempted in every case. The danger of complications and anaphylaxis, if present at all, are distinctly less.

Schwarz and Ottenberg,¹ in summarizing the hemorrhagic disease of the newborn, with special reference to blood coagulation and serum treatment, conclude that the injection of serum is doubtful. They refer only to injections with animal serum; they do not mention Welch's article in the previous number of the same journal, and advise direct transfusion. I have called attention to three successful cases of blood transfusion for melæna neonatorum.

If one can judge from the results as portrayed in the literature, the serum treatment for hemorrhagic diseases and hemorrhage is giving better results than gelatin, adrenalin, and calcium salts. Karl Wirth² presents a collective review on the more recent methods of treating hemorrhage, with emphasis on serum treatment. One is surprised to see no references to American contributions, which have been of great value in this special field.

Hemorrhagic Diseases. Mosenthal³ reports a successful transfusion for melæna neonatorum. The suture between the artery of the father and the femoral vein of the infant was performed on the third day of the infant's life by Alexis Carrel. The hemorrhage was checked at once.

Kottmann and Lidsky⁴ are of the opinion that in hemophilia there is an absence of thrombokinase. They employ fresh animal livers; the livers are chopped and ground, then soaked in water, and afterward filtered through cloth; this filtrate is applied to the wound and checks the hemorrhage. This, of course, is simpler than the preparation of animal or human serum and its injection subcutaneously.

Trembut⁵ employs the serum of sheep in hemophilia. He first gives 5 c.c. subcutaneously; a few days later 10 c.c., and a few weeks later 19 c.c. Trembut advises that druggists keep normal standardized

¹ American Journal of the Medical Sciences, July, 1910, vol. exl, p. 17.

² Centralbl. a. d. Grenzgeb. d. Med. u. Chir., 1909, xii, 177.

³ Journal of the American Medical Association, May 14, 1910, vol. liv, p. 1613.

⁴ Münch. med. Wochenschr., January 4, 1910.

⁵ Mitteilungen a. d. Grenzgeb. d. Med. u. Chir., 1910, xx, 814.

sheep serum for hemorrhage; Leary, however, has shown that it should be made fresh. The preparation of this serum should be left to the laboratories of medical schools and hospitals, or to first-class pharmacists who are equipped for such work, but, as the technique of its preparation is not difficult, the time is surely coming when the physician will have to prepare his own human or animal serum. It is not more difficult than the removal of blood for a culture.

ANESTHESIA

The importance of this question is exemplified again in this country by the fact that this subject in all its phases has been chosen as the chief theme of a symposium at the next meeting of the American Surgical Association in Denver.

In discussing this question in previous numbers of *PROGRESSIVE MEDICINE*, I have devoted myself to bringing out new methods, improvement in old methods, the importance of a trained anesthetist, the dangers and complications of the different methods and narcotics, and the factors which influence the choice of the anesthetic.

From the beginning, my own experience and that in the literature forced the position that ether was the anesthetic of choice in the majority of cases, and for years before it was systematically adopted in this country I had described and advocated the drop method on the open cone.

With less expert anesthetists and with the older methods of giving ether, local anesthesia (after the infiltration method of Schleich, or combined with the intraneural method of Braun) was employed extensively in many clinics. However, as the ether drop method on an open cone gathered strength from experience, local anesthesia in these clinics became less and less used.

Some years ago I rarely gave ether to a patient with hernia; it was always local anesthesia. Today it is the reverse. The same is true in thyroidectomies.

In these reviews I never could recommend rectal or spinal anesthesia, nor have I been able to be enthusiastic or recommend scopolamin-morphine alone or as an adjunct to other forms of anesthesia.

Some years ago I called attention to the growing importance and the increasing field of nitrous oxide and oxygen. That it is a splendid method is shown by the fact that in the clinics where the ether drop method had reached its zenith of perfection, nitrous oxide and oxygen are now becoming the anesthetic of choice.

Today the patient should demand and should receive the anesthetic which allows the necessary operation to be performed with the least danger.

I wish to inject a new thought in the review of this year. That is the relationship between the surgeon and the trained anesthetist.

It is my opinion—and I have expressed it in these pages before—that the surgeon cannot turn over to the anesthetist all of the responsibility of anesthesia, and he must expect of his trained anesthetist to make a special study of the symptoms of shock. Together, surgeon and anesthetist must have all their senses bent upon judging the condition of the patient and the effect of the narcosis upon the patient. It is true that often technical difficulties will for the moment concentrate the attention of the surgeon. It is in such moments that the presence of a trained anesthetist lessens the wear and tear.

There are things which the surgeon sees in the wound, in the respiration, that the anesthetist cannot see. The color of the blood is a better index to cyanosis than the color of the patient's face. Today I had a trained anesthetist assisting me. The anesthetic was nitrous oxide; the anesthetist was covered with the protecting sheet; the blood in the wound was cyanotic, extremely so. I said to the anesthetist, "How is the patient's color?" He answered enthusiastically, "Splendid!" I then said, "Give the patient oxygen and turn off the nitrous oxide and stop the rebreathing." The change in the blood to normal was immediate. The anesthetist who was assisting me said, "The operator is in a much better position to quickly notice changes in the color of the blood than the anesthetist at the mask."

The best result, therefore, will be obtained when the two work together.

Gatch, whose work on nitrous oxide and oxygen anesthesia has given him a place among the expert anesthetists in this country, illustrates the type of the anesthetist whom I would recommend. He is interested in all the problems of shock, in their multitude of relations to anesthesia, to rebreathing, to hemorrhage, to chilling, to overheating, to trauma in the wound, and so forth.

The best results in handicapped cases will be obtained when the trained anesthetist, stimulated by his greater responsibilities, works without friction and in harness with the experienced surgeon who is then relieved by the thought that he has as a helpmate an equally trained colleague at the anesthetic mask.

Apnea and Surgical Shock. The interesting experimental work of Yandell Henderson¹ in the physiological laboratory of the Yale Medical School is more appropriately discussed here under anesthesia, because he has demonstrated the relation of respiration to shock, and to the fact that death may be due to fatal apnea, and this apnea is dependent upon diminished CO₂ content in the blood. This paper was presented before the Johns Hopkins Medical Society, December 6, 1909, and contains references to other papers by the same author.

¹ Bulletin of the Johns Hopkins Hospital, August 10, vol. xxi, p. 235.

From the work of Crile, Howell, Porter, Meltzer and others the relation of surgical shock to the circulation, and especially to the vasomotor centre, has been emphasized to such a degree that the relation to respiration has not been sufficiently dwelt upon, but Henderson finds in the experiments of these investigators, as well as in his own, evidence supporting his view.

It may be stated briefly that respiration depends upon the continuous stimulation of a certain amount of CO_2 in the blood. The respiratory centre is not automatic. Those afferent impulses, pain and so forth, which we know from experimental and clinical observation lead to the condition called surgical shock, also, as we know, increase respiration, and Henderson states that this increased respiration may diminish the amount of CO_2 in the blood to such a degree that apnea follows. Now, respiration must be maintained artificially, or the patient dies. He proposes that the oxygen should be mixed with a certain amount of CO_2 , so that the amount of this gas in the blood can be controlled by the anesthetist. He also advises rebreathing.

In very critical cases a catheter can be passed to the division of the bronchus and respiration maintained by the Meltzer and Auer method.¹

Gatch,² who has a large experience with nitrous oxide-oxygen anesthesia, feels that his observations upon man confirm Henderson's views, and he is of the opinion that rebreathing to a moderate degree is harmless, providing the patient is given plenty of oxygen. I would advise every surgeon and every anesthetist to carefully read the publications of Henderson.

Continuous Respiration without Respiratory Movement. In May, 1910, through the invitation and courtesy of Dr. Wyeth, I was able to be present at the New York Surgical Society and to listen to Dr. Meltzer's presentation of his new method of anesthesia devised by him with the aid of Dr. Auer, and also to witness Dr. Elsberg's demonstration of the apparatus which he has devised for the employment of Meltzer's and Auer's method on human beings.

The next day I had an opportunity to witness this method in the physiological laboratory of the Rockefeller Institute.

The interesting problems in physiology should be read in the original reports.³

In Meltzer's experiment the dog is anesthetized, the tongue is pulled forward, and a medium-sized catheter is passed through the larynx until it strikes the bifurcation of the bronchus, then it is withdrawn about one inch; to this catheter with a longer rubber tube an ordinary bellows is attached. It is possible, therefore, to force into the lungs

¹ Journal of Experimental Medicine, July 17, 1909, vol. xi, p. 622.

² Journal of the American Medical Association, March 5, 1910, vol. liv, p. 775.

³ Medical Record, March, 1910; Elsberg, Annals of Surgery, July, 1910, vol. lii p. 23; and Lilienthal, *ibid.*, p. 30.

air, oxygen, or any gas with or without the vapor of a narcotic. Interchange takes place between these gases and the blood in the lung without respiratory movement. It is very simple to filter the gases and to warm them. That respiration is absolutely maintained without movements of the chest or lung can be demonstrated by opening the chest of the animal who lives for hours. By simply increasing the pressure of the gas forced into the lung through the tube a temporary expansion of the lung is immediately produced. There is no difficulty in maintaining at intervals over- and under-pressure, and apparently it is better for the animal that this expansion and collapse of the lung be maintained at intervals corresponding to normal respiration. The exact state of the lung is, therefore, under absolute control.

Alexis Carrel has employed this method for anesthesia in all of his animal work for operations on the heart and lung. It has all the advantages, therefore, of the over- and under-pressure methods. Elsberg and Lilienthal have used it successfully in man with Elsberg's apparatus, which simplifies the technique.

Should experience prove that this method of anesthesia has no greater dangers than other forms of anesthesia, Meltzer and Auer will have made a great contribution to surgery. Anesthesia through a catheter would simplify the technique of many operations in the region of the head and neck; it will make surgery of the chest possible without the expensive Sauerbruch and Brauer chambers. With this method there is no doubt that in critical periods one will have much better control of respiration, and if Henderson's view of shock is correct, the amount of CO_2 in the blood can be maintained absolutely.

Intravenous General Anesthesia. As narcosis depends upon a certain saturation of the blood with the anesthetic, it apparently makes very little difference how the anesthetic gets into the blood. L. Burkhardt¹ was the first to introduce ether by intravenous infusion. He employed a 5 per cent. solution of ether in salt solution. The technique does not differ from that of any intravenous infusion. The amount of fluid injected varied from 200 to 800 c.c. He reports on 33 cases, with no bad results, but of 8 cases in which he employed a mixture of ether and chloroform there was transient hemoglobinuria in 1. The technical advantage, of course, will be chiefly felt in operations in the region of the head and neck. In other respects, I am not impressed that the narcosis was any better than by the ether drop method. Burkhardt states that recovery is more rapid, and the drug is eliminated more quickly than after inhalation narcosis. Burkhardt, as a rule, employs a previous dose of scopolamin-morphine.

The first question to be settled is, What are the dangers of thrombosis and embolism. Küttner seems to have settled this, at least to his

¹ Münch. med. Wochenschr., 1909, No. 46.

own satisfaction. With his experience in 23 cases he noticed, first, that in 2 cases the infusion ceased to flow and a new vein had to be employed. In a third case (the last one) there were definite symptoms of embolism and the section of the vein showed thrombosis.

It is but natural to ask whether the danger of thrombosis and embolism is any greater with this ether solution than with the normal saline. Even with our experience with intravenous salt infusion we hesitate to employ it as a routine procedure.

The first impression, then, with this method of Burkhardt is like that produced by spinal anesthesia. It seems to have, *a priori*, risks.

Burkhardt's¹ answer to Küttner's communication does not, in my mind, help matters any. He says, if thrombosis is expected or feared, add to the solution 0.04 gram of hirudin to 100 c.c. of the ether solution. Burkhardt has used it in both man and animal. I² have referred previously to hirudin. Rimann and Wolff had shown that it would diminish the coagulation time of the blood, and could be employed to prevent postoperative thrombosis, but Boggs' experimental work demonstrated such changes in the kidney, so that he did not feel justified in recommending its employment in human beings.

Clairmont and Denk³ conclude that Burkhardt's method has too many disadvantages to compete with good general anesthesia. Pikin,⁴ after an experience with 16 cases in Grekow's clinic in St. Petersburg, reports unfavorably. The sixteenth case died.

Janssen⁵ has tried various forms of general intravenous narcosis, with many anesthetics, until finally he was able to establish a technique in which the solution was infused a drop at a time, but the death of a dog from embolism of the lung showed that the dangers are greater than good general narcosis.

Giani⁶ has employed chloroform for intravenous anesthesia in Durante's clinic in Rome. He was favorably impressed, and observed nothing but transient albuminuria.

Intravenous Hedonal Narcosis. Fedorow and Jeremitsch⁷ stimulated by Burkhardt's work, experimented upon animals. They found that intravenous chloroform was dangerous on account of its effect upon the lung and kidney, and that intravenous ether was uncertain unless employed with scopolamin-morphine, and even then it often became necessary to give a small quantity of some anesthetic by inhalation. Having had experience with *hedonal* as a hypnotic, they tried it on

¹ Centralbl. f. Chir., 1910, xxxvii, 355.

² PROGRESSIVE MEDICINE, December, 1909, p. 137.

³ Wiener klin. Wochenschr., 1910, xxiii, 286.

⁴ Centralbl. f. Chir., 1910, xxxvii, p. 673.

⁵ Münch. med. Wochenschr., January 18, 1910, lvii.

⁶ Policlinico, December 10, 1909, xvi.

⁷ Centralbl. f. Chir., 1910, xxxvii, pp. 37 and 675.

animals and found that it was the best intravenous narcotic. They have now an experience of 45 cases in man. The solution employed is 0.75 per cent. in salt solution. About 100 c.c. is injected at a time; the patient falls asleep quickly after the first injection. According to the body weight and the duration of the operation, these injections may have to be repeated from one to three times. No complications were observed. On three occasions the vein at the point of injection became thrombosed, but this was not viewed as a dangerous complication.

These communications place intravenous general narcosis before the profession for further consideration. Last year I referred to the work of Nerking and Schuermann¹ who had employed the method in animals only. Since then this considerable literature has accumulated.

Intravenous Local Anesthesia. Little has been added to the technique described by Bier in 1908, before the German Surgical Congress, which I² reviewed last year. Jas. M. Hitzrot³ in his three cases used Bier's technique throughout, with the conclusion that it is superior to the infiltration method of Schleich. Momburg⁴ adds a slight modification. After the anesthetic is introduced into the vein, a third rubber band is placed below the central one, and this is the band that now constricts the anesthetized area; the first central band is removed. This relieves the patient of a restricting band over a sensitive area. It appears to me, however, that there is an objection to placing the third band and removing the first; there would be danger of some of the anesthetic in the vein getting into the circulation.

Intra-arterial Local Anesthesia. I have mentioned⁵ that Goyanes had employed intra-arterial regional anesthesia with a technique similar to that of Bier, except an artery was injected. Ransohoff⁶ modifies it somewhat and calls it *terminal arterial anesthesia*. The main artery supplying the part to be anesthetized is exposed under Schleich's infiltration method, then a rubber band is placed on the limb above the exposed artery, tight enough to constrict veins, but not to constrict the artery. Into the arterial vessel there is now injected, with a very fine needle, 4 to 8 c.c. of a 0.5 per cent. of cocaine in normal salt solution. After injection, the bandage is tightened. The maximum dose should be 8 c.c. It is an ideal method for certain positions.

W. A. Oppel⁷ presents, first, his experimental foundations for terminal arterial anesthesia. In rabbits, injections which are fatal when made into the vein are harmless when made into the artery. If the venous

¹ PROGRESSIVE MEDICINE, December, 1909, p. 138.

² Ibid., p. 145.

³ Annals of Surgery, 1909, vol. 1, p. 782.

⁴ Centralbl. f. Chir., 1909, xxxiv, 593.

⁵ PROGRESSIVE MEDICINE, December, 1909, p. 146.

⁶ Annals of Surgery, 1910, vol. li, p. 453.

⁷ Centralbl. f. Chir., 1909, xxxvi, 1017, and 1910, xxxvii, 546

circulation is slightly obstructed, the amount of anesthetic which can be introduced into the artery can be slightly increased. In animals, introduction of cocaine into the abdominal aorta produces complete anesthesia of both limbs. Oppel's technique varies very little from that of Ransohoff's, already described. He first makes the limb bloodless, and then exposes and injects the artery below the bandage. He reports 3 cases on man. In 2, he injected the radial artery with 7 c.c. and 10 c.c. of novocain solution respectively, and did not obtain anesthesia. Only when he injected 40 c.c. of this solution into the dorsalis pedis did he obtain satisfactory anesthesia. Bier injects from 50 c.c. to 100 c.c. of this solution in his intravenous method, so it will be perfectly justifiable to try larger amounts in the arterial. Ransohoff used 8 c.c. of a 0.5 per cent. cocaine solution.

With good nitrous oxide-oxygen anesthesia and with my experience with Schleich's local infiltration anesthesia I have as yet found no occasion to employ the intravenous or intra-arterial methods.

Local Anesthesia. There is nothing of importance new on the older methods of anesthesia, but the infiltration method of Schleich combined with the intraneural method of Braun still hold a distinct place, as shown by the communication of McArthur.¹ He recommends Braun's standard solution of novocain. Peukert,² from Braun's clinic, presents a very extensive article, giving pictures representing the points for reaching the nerves in various operations on the head, face, and jaws.

Braun's standard solutions are as follows:

	I.	II.
Novocain	0.25	0.25
Physiological salt solution	100.00	50.00
Suprarenin solution, 1 to 1000 drops	5.00	5.00

The weaker solution should be employed when possible. I still employ Schleich's weaker solution—0.01 per cent. of cocaine:

Cocaine hydrochloride	0.01
Sodium chloride	0.2
Morphine hydrochloride	0.005
Distilled water	100.000

Hess,³ in the discussion as to what extent local anesthesia can replace general narcosis, states that in the Stettin clinic the percentage of local anesthetics has increased from 11 to 21, with a corresponding decrease in general narcosis. In my experience, with good ether drop narcosis, and especially since the introduction of nitrous oxide-oxygen, the number of operations under local anesthesia is diminishing, and with the average

¹ Surgery, Gynecology, and Obstetrics, 1909, vol. viii, p. 578.

² Beitr. z. klin. Chir., 1910, lxvi, 377.

³ Centralbl. f. Chir., 1910, xxxvii, 679.

patient there is no increased danger of discomfort. I, however, agree with Hess that for the resection of ribs for empyema local anesthesia should be preferred. Braun's special technique of intraneural injection is, on the whole, carried too far, and I am confident that in many instances it has no advantages over general anesthesia. Nevertheless, it is good anatomical training to carefully study Braun's diagrams, because they will be found of great advantage in the treatment of various forms of neuralgia by alcohol and salt-solution injections.

Scopolamin-morphine Narcosis. I have again and again called attention to this method, but have never been able to see any justification in recommending it. Hatcher¹ made the report on this method of narcosis in surgery and in childbirth to the Council of Pharmacy and Chemistry. The report is distinctly adverse to its employment. He states that it is wholly unsuited for general anesthesia alone. In combination with chloroform and ether it renders the problem of anesthesia more complicated. It has some advantages and perhaps, now and then, it can be employed with the greatest care. For general use it should be condemned, and when it is employed the solutions should be most carefully prepared, especially the scopolamin should be obtained from the most reliable drug firm. One will find in this excellent article a good summary of the whole question, with seventy-two references to the literature.

Collins² presented before the Western Surgical and Gynecological Association his experience with 1100 cases in which the drugs were employed preliminary to general anesthesia. He gives scopolamin $\frac{1}{100}$ grain, and morphine, $\frac{1}{6}$ grain (freshly prepared solutions), one and one-half hours before the operation; after this the patient is kept quiet. The skin of the patient is prepared while the general anesthesia is being administered. In exophthalmic goitre he gives the injection the night before. At first he used chloroform, now he uses ether, and quite recently nitrous oxide. He has had no fatalities and only one case exhibited unpleasant symptoms. Apparently this is the safest way to employ the combined drug. Of both, the dose is small and within safe limits. Whether this combination has any advantage over atropine and morphine I am not prepared to say.

Jamieson,³ in some experimental work with scopolamin-morphine on animals, observed alarming symptoms on the part of the respiration—symptoms which have also been observed clinically.

It seems to be the consensus of opinion that, if one has the choice, the less toxic agent should be employed. Safety comes before comfort. It required many years for ether to replace chloroform. Chloroform

¹ Journal of the American Medical Association, February 5 and 12, 1910, vol. liv, p. 446, 516.

² Journal of the American Medical Association, March 26, 1910, vol. liv, p. 1051.

³ British Medical Journal, March 26, 1910.

anesthesia, on the whole, is much quieter than ether. It appears that nitrous oxide is safer than ether, and I am sure it will win out in the end, even if operations under this method are more difficult for the surgeon. Scopolamin-morphine may, and probably does, make general narcosis to a certain extent better; but if it is found that scopolamin is an added danger, it will certainly be discarded, and in view of what we know of scopolamin-morphine one should be very cautious in its employment.

Ethyl Chloride Anesthesia. Here we have the identical problem. Ethyl chloride is convenient to anesthetize a patient rapidly for a short operation, or as a preliminary to general anesthesia, but it seems to be a drug more dangerous than ether and distinctly more so than nitrous oxide. Why, therefore, employ it?

Lotheissen¹ presents his twelve years' experience with ethyl chloride and oxygen narcosis, first in von Hacker's clinic in Innsbruck, and later in Vienna. Apparently with Lotheissen it is the anesthetic of choice.

Webster² has employed it 1880 times in the General Hospital of Winnipeg. Hornabrook³ suggests, and reports on, a new method; the ethyl chloride is given by the drop method on an open cone and is gradually replaced by ether, and in some instances with chloroform as an adjunct.

After my experience with the ether drop and the nitrous oxide-oxygen methods, I cannot but feel that, comparatively, ethyl chloride is not as safe.

Nitrous Oxide-oxygen Anesthesia. After some months' experience with this form of anesthesia administered by Dr. Gatch, Dr. Halsted remarked that he was of the opinion that almost any other method of general anesthesia had become a subject of historical interest. The method as employed in Dr. Halsted's clinic and the apparatus devised by Gatch have been reported.⁴

This method of anesthesia is rapidly becoming the one of choice in all the large clinics.

It appears to me that this method must present to the surgeon an unusually strong appeal on account of its safety. From the standpoint of the surgeon it has no special advantages. Muscle relaxation is never quite as good; on account of the various gases under pressure it is noisy; the mask is large and gets in the way in operations upon the face and neck. Yet, in spite of these disadvantages, the argument that it is safer makes it the anesthetic of choice.

The apparatus is an important part of this method of anesthesia.

¹ Archiv f. klin. Chir., 1909, xci, 65.

² Surgery, Gynecology, and Obstetrics, 1909, vol. viii, p. 402.

³ Australasian Medical Gazette, Sydney, March, 1910.

⁴ Loc. cit.

My experience is entirely with that devised by Gatch. It is a method of anesthesia much more difficult to give than the ether drop on the open cone. Only those who are specially interested in it will become expert. Yet in my clinic at St. Agnes' Hospital I have been surprised to find how rapidly the interne has become expert with the method. Another disadvantage is its expense.

I am not at all prepared to say that this method will replace ether absolutely on an open cone; for some individuals and for some operations it does not seem available.

About one-half hour before the anesthesia the patient receives a hypodermic injection of atropine and morphine. A patient can be kept under this anesthetic for any length of time necessary for any operation. It will be found that in some laparotomies ether will have to be combined with this narcosis. Muscular men and alcoholics are not good subjects. I have observed that in operations involving extensive dissection there is more capillary oozing than under ether. The pulse, as a rule, is a little more rapid. As the patient comes out of the anesthetic very quickly, the surgeon and his assistants must be careful in discussing the prognosis, because the patient may hear statements apt to give them a great deal of mental anguish.

Rectal Anesthesia. Walter S. Sutton,¹ of Kansas City, contributes a very careful study of his experience with about 140 cases in which ether was administered by this method at the Roosevelt Hospital in New York. The longest operation was two hours and twenty minutes. He illustrates the apparatus very well. In 12 cases there was a preliminary injection of scopolamin-morphine. Sutton is of the opinion that the method is more complex than the usual administration of ether on the open cone. Of course, it is especially useful in operations upon the head, neck, and chest. It is contraindicated if there is any lesion of the colon. It is not particularly available in any laparotomy, or any operation upon the rectum, nor for emergency work on account of the necessary preparation of the large bowel. Sometimes it is necessary to supplement it by ether in the ordinary way. In 25 of his cases oxygen was used as a vehicle for the ether vapor. In large surgical clinics where it is possible to have trained assistants this method, with its somewhat intricate apparatus, should be tried in those cases in which the usual method complicates the technique of the operation upon the head, face, and neck.

Electric Sleep. Tait and Russ² present an experimental and clinical study of Leduc's method which he first published in 1902.

According to the position of the electrodes and the potential used, the Leduc current may produce three different conditions:

¹ *Annals of Surgery*, 1910, vol. li, p. 457.

² *Journal of the American Medical Association*, November 13, 1909, vol. liii, p. 1611.

1. Analgesia, superficial or deep, or both.
2. Respiratory and cardiac inhibition.
3. Electrocutation.

The close inter-relation of these three conditions constitutes the element of danger in the Leduc current. Its practical value in experimental surgery on animals is at the present time almost *nil*, and it will require a vast amount of investigation before electricity can be considered as a safe and reliable agent.

Leduc¹ reports that he is still confining his experiments to animals. He tried it on himself only up to the point of narcosis and then discontinued it. If the electrodes are applied to a single nerve local anesthesia is produced.

Johnson,² of Hartford, Conn., reports a case in which electric local anesthesia was applied to the anterior and posterior tibial nerves; the electricity was obtained from storage batteries of 100 amperes strength. The interruptions following Leduc's method were made from six to seven thousand times a minute. As a local anesthetic it was very successful for the operation on the lower extremity.

Wassermann's Reaction and Narcosis. The observation first made by Wolfsohn³ in Kausch's clinic that patients whose serum is negative before operation may show the reaction if obtained during or immediately after the operation is important in practical diagnosis. He found it present in 22 per cent. among 50 cases. The reaction remains positive only for a short time.

In taking the serum for diagnosis, therefore, it should be obtained before operation or some five or six days later. It seems to make very little difference what the narcotic is. Recent investigations have shown that Wassermann's reaction takes place when the antigen is replaced by a lipid, and, according to the Meyer and Overton narcosis theory, anesthesia is the result of a physical change in the condition of the cell lipoids. The fact that in about 22 per cent. of the cases the blood of narcotized patients gives a temporary positive Wassermann furnishes further proof of the non-specificity of the Wassermann reaction and its intimate relation to lipid bodies.

Reicher,⁴ in confirming Wolfsohn's observation, assumes not only a physical change in the condition of the cell lipoids, but the most decisive factor in the effect of a narcotic is its relative solubility in the lipoids; an elimination of vital lipoids and fats takes place which perhaps also plays some part in the narcosis, and can be demonstrated chemically and microscopically in the blood, and histologically in the organs for some time.

¹ Arch. f. physik. Med. u. med. Technik., Band v, Heft 1; review in Centralbl. f. Chir., 1910, xxxvii, 444.

² Medical Record, April 23, 1910.

³ Centralbl. f. Chir., 1910, xxxvii, 829.

⁴ Ibid.

OPERATIVE TECHNIQUE

Gloves. Bishop¹ is of the opinion that gloves are unnecessary for the surgeon himself, although they should be worn by the assistants. He also objects to masks. It is my opinion that we should try to simplify technique, but I look upon gloves and masks as additional safeguards.

Pinchus Braun,² from Lexer's clinic in Königsberg, presents an experimental study of the best method of sterilizing rubber gloves. Chemical methods can be discarded as unreliable; boiling the gloves in soda solutions just as the instruments are sterilized is the most certain method. Braun, however, finds objections to this method, first, on the side of cost, because repeated sterilization by boiling in soda rapidly destroys the rubber; second, the glove must be put on wet, and this macerates the surgeon's hands if he has to operate much.

I have used gloves sterilized by boiling since 1894, and find no objection to the wet method. However, there are a number of surgeons throughout this country who sterilize their gloves by steam, and I wish to call their attention to Braun's experiments. He was unable to perfectly sterilize rubber gloves unless they were kept in steam at least one hour. At the end of half an hour there were many organisms; at the end of three-quarters of an hour a few spores only, or now and then an organism in a kink in the glove.

Sterilization is best accomplished by placing inside the rubber glove a cotton glove; the glove is spread out smoothly between gauze, and covered with talcum powder. This sterilized with steam at least one hour gives a clean, dry glove, and the effect upon the rubber is less than by boiling in soda.

Preparation in this way, of course, will require more time by the nurse, and if the surgeon does not prefer a dry glove it seems to be unnecessary to add to her burdens.

Disinfection of the Skin. This includes the hands of the surgeon and the skin of the field of operation.

GROSSICH'S IODINE METHOD. This simple procedure to disinfect skin and hands has received more attention in the two years since the preliminary report³ than any other novelty in technique. At the Medical Congress in Budapest, in August, 1909, Grossich was able to present his original idea to a large audience. In his last communication⁴ he states emphatically that he has not changed the original technique. The official, undiluted tincture of iodine is employed—a 10 per cent. solution. He objects to the modifications—they are unnecessary.

¹ Surgery, Gynecology, and Obstetrics, 1908, vol. vii, p. 250.

² Beitr. z. klin. Chir., 1909, lxiv, 336.

³ PROGRESSIVE MEDICINE, December, 1909, p. 148.

⁴ Centralbl. f. Chir., 1910, xxxvii, 737.

For example, some surgeons cleanse the skin with alcohol, benzine, or ether first; others dilute the tincture, for example; Hesse employs 200 c.c. of the official tincture of iodine with 800 c.c. of alcohol. Grossich feels that perhaps the diluted tincture may be just as good, but in his experience with the official tincture there need be no fear of eczema or dermatitis.

I have not given the method a trial as yet, but I am impressed that it is taking a distinct place in operative technique and it is along the line of simplifying technique without danger to the patient.

My associate, McGlannan,¹ suggests that this method be employed in military surgery at the first dressing on the firing line, or at the first dressing station. No water is required, and sufficient of the tincture of iodine for a large number of patients can be carried in a small flask.

At the meeting of the State Medical Society of Wisconsin, in June, 1910, I had an opportunity to hear an unusually good *résumé* of the literature, combined with personal experience of their own as to the value of tincture of iodine as a skin antiseptic, by M. W. Dvorak and W. H. Brown. Their conclusions agreed with those of the originator of the method.

Pers² has employed Grossich's original method with success in sixty-seven minor operations. After shaving, the field is swabbed with the iodine solution and then again, after the patient is under narcosis, and a third time after the wound is sutured. Pers has observed no mishaps. In some of his cases one-third of the body was swabbed with iodine.

Umber³ looks upon this method as superior to all and recommends it to the internist and the general practitioner. Unger⁴ has employed it in twenty-five laparotomies. He warns that in case of fluid in the peritoneum the skin must be kept dry or the iodine is washed away. In peritonitis he swabs the various layers of the abdominal wall as they are sutured.

Bogdan⁵ is one who has modified the technique by first cleansing with benzine. Waterhouse⁶ employs a diluted solution—2 per cent.—in alcohol. In laparotomy wounds drained or where there is a possibility of infection from a colostomy or a cholecystostomy, the wound is painted daily with iodine. Berard⁷ has tested the iodine method in accidental wounds and for sterilization of the hands. He found that hands experimentally contaminated were sterilized by tincture of iodine. He follows Grossich's technique without modification.

¹ The Military Surgeon, November, 1909, vol. xxv, p. 602.

² Ugeskrift for Læger, Copenhagen, November 11, 1909; reviewed in the Journal of the American Medical Association, January 15, 1910, vol. liv, p. 248.

³ Therapie der Gegenwart, December, 1909, 1, 553.

⁴ Berliner klin. Wochenschr., January 10, 1910.

⁵ Centralbl. f. Chir., 1910, xxxvii, 73.

⁶ Lancet, London, April 16, 1910.

⁷ Lyon Chirurgial, May, 1910, iii.

Lanz¹ has compared Grossich's iodine method bacteriologically with the following older procedures: *Fürbringer's*—mechanical cleansing with soap and water followed by ether and alcohol, and then by 1 to 1000 bichloride; *Schumburg's*—absolute alcohol, 100 c.c.; ether, 50 c.c.; pure nitric acid, 0.75 c.c.; *Lanz's*—5 per cent. salicylic alcohol.

Only in Fürbringer's method did he obtain no colonies in the culture tubes, in the other methods the number of colonies was very small, but always a little greater in Grossich's method.

Lanz is of the opinion that Grossich has made a distinct contribution of chief value in military surgery and other accidental wounds, for disinfection of the skin in areas more difficult for the ordinary methods, and when we do not wish to chill the patient by the longer exposure of mechanical and chemical disinfection.

Papaoianu² writes that he began very cautiously with small operations, but the healing results were so good that he was encouraged to employ the method in larger interventions, and here again he has encountered no mishaps.

ALCOHOL. I mentioned last year that in von Bruns' clinic alcohol alone was used for the disinfection of the skin. Apparently in many clinics surgeons are putting more dependence upon alcohol than any other agent. The theory is that it hardens the skin and keeps the bacteria in, and it is for this reason that von Bruns and others discarded the mechanical scrubbing with soap and water on the theory that it brought out the bacteria from the hair follicles and sweat glands.

Now we have an extensive experimental and critical investigation upon the bacteriological significance of the skin glands and their secretion in aseptic surgery by L. C. Peel Ritchie,³ who reaches the following very interesting conclusions:

1. There is lack of proof that the sweat glands of the normal skin or their ducts offer a resting place for germs.

2. The experimental evidence offered for this is unsatisfactory, and microscopic study has always been negative.

3. There is every reason to believe that the flow of secretion, its fatty consistency, and constancy, furnish complete protection against the invasion of germs.

4. Under certain abnormal conditions, for instance, in a very dry, rough skin on which the usual fatty material is absent, and when the microorganisms are rubbed in, the sweat-gland ducts may, at their orifices, admit a few germs which, however, are rapidly eliminated.

5. The surgeon may disregard sweat secretion as a source of reinfection.

6. Experimental evidence indicates that microorganisms are not easily introduced into the hair follicles; certainly never sufficiently to render removal by mechanical means impossible.

¹ Centralbl. f. Chir., 1910, xxxvii, 849.

² Ibid., xxxvii, 905.

³ Archiv f. klin. Chir., 1910, xci, 449.

7. Microorganisms when introduced into the follicles by friction remain superficial, do not enter the glands, and are probably eliminated by natural processes.

8. There is no proof extant that the contents of the hair follicles have any practical importance for the operating surgeon.

This work, therefore, although it does not disprove the clinical value of alcohol or iodine, creates a doubt as to the explanation of their efficacy.

Grekow¹ has studied very carefully the comparative value of alcohol and Grossich's iodine method, and he is not prepared to say which is the better method—both are good.

In the alcohol method he washes his hands with soap and water, then dries them on a towel; then, for five minutes by the clock, scrubs the hands with gauze wet in 95 per cent. alcohol; the hands are dried. During the operation the hands are dipped in alcohol. He does not try to get rid of the blood during the operation. For this reason, at the end of the operation, his hands are distinctly blood-stained and difficult to clean. He does not wear gloves. For the field of operation he uses alcohol or tincture of iodine on the dry skin. There is no previous preparation, except a bath the night before. The iodine method is more rapid.

Langemak² reports splendid results with the unmodified Grossich's method. Pure alcohol is just as good for both the skin of the patient and hands of the surgeon. He has found *tannic acid in alcohol* also good for the skin of the patient, but hard on the hands of the surgeon.

This method of a 5 per cent. tannin in alcohol has been recommended by Zabłudowski.³ He finds it reliable for both hands and field of operation. He objects to the iodine and benzine-iodine methods on account of staining the skin and irritation of the surgeon's hands. The solution of tannin in alcohol is employed just as alcohol is. His clinical work was confirmed by bacteriological experiments.

O. von Herff⁴ again reports on his experience with *acetone-alcohol*. He has modified the solution as follows: 10 parts each of benzene and dammar resin in 100 parts of ether stained with 20 per cent. of an alcohol-iodo-iodide solution (7 parts iodine, 5 parts potassium iodide and 100 parts alcohol).

I am impressed that surgeons everywhere are attempting to simplify the technique of cleansing the skin of the field of operation and of their hands. In view of the perfect results that we have obtained by the more tedious methods, and especially by the employment of gloves, we should proceed very cautiously in changing technique, and I trust that every surgeon will be very reluctant to substitute any method of cleaning the hands for gloves.

¹ Archiv f. klin. Chir., 1909, xc, 1073

² Centralbl. f. Chir., 1910, xxxvii, 953.

³ Ibid., xxxvii, 273.

⁴ Therapie der Gegenwart, December, 1909, vol. 1.

Sterilization of Instruments. I reviewed last year the good suggestion of Saussailow and Telitschenko to sterilize knives and scissors in the flame of alcohol. Levai¹ makes the following suggestion to prevent rusting of metal instruments and sterilizing apparatus. He adds to the boiling water, before the instruments are placed in it, enough hydroxide of soda to make a 0.25 per cent. solution. This makes the solution milky.

Sterilization of Sponges, Towels, etc. There is nothing new on this subject. Apparently everywhere these materials are sterilized in steam under pressure. There is room for simplifying here.

Wound Treatment during Operation. We see practically no publications on this subject which a number of years ago excited so much interest. In clean wounds the rule is asepsis. Some surgeons prefer to swab out the wound with gauze wrung out with salt solution. It seems less irritating to tissues than the dry gauze. In abdominal surgery, from the investigations of von Mikulicz, all the gauze which comes in contact with peritoneum should be wet in warm salt solution.

I have employed for years, in certain large wounds in which there was an opportunity for infection during the operation, sponges of iodoform gauze, feeling that the iodoform and the blood would combat the infection better than without the aid of the iodoform. Neuber years ago demonstrated that iodoform blood clot remains sterile much longer than a pure blood clot. The recent investigations on tincture of iodine would indicate the decided advantages of iodine-impregnated gauze for drainage. It seems to me we cannot question our experience of years, that a suppurating wound or cavity is comparatively cleaner when drained with iodoform gauze than without such drainage. Bismuth acts very much in the same way.

Ligature and Suture Material. Personally, I believe that our ligature and suture material is good enough. Silk, catgut, and silver wire each have their distinct place. The test of a surgeon's technique is his fearless use of silk in clean wounds. Catgut is not difficult to prepare, and it has a distinct advantage over silk in many places. The surgeon, too, should know when to use silver wire.

Kuhn² again finds fault with every method for preparing catgut, except when it is obtained sterile from the animal and is treated later with iodine or silver. This, of course, is an elaboration which will add to the already expensive material, and it seems to me, from the experience with commercial catgut and various methods of preparation, unnecessary. But I am not in a position to discuss all the points in regard to the preparation of catgut. Since I have employed catgut more extensively, it is not infection that I fear, but that the catgut may break when employed exclusively in laparotomy wounds. So far I

¹ Centralbl. f. Chir., 1908, xxxv, 135.

² Deutsche Zeitschr. f. Chir., 1910, civ, 346.

have been fortunate, and no wounds have broken down. In very muscular individuals, however, and in certain other cases I use silk in addition to catgut. The surgeon, therefore, should study when catgut should be reinforced by silk. It would appear from recent literature that the iodine catgut is most popular.

Max Madlener,¹ in discussing the question between catgut and silk, states that if one uses silk he should employ as thin a thread as possible; it is the heavy silk that is more apt to give trouble. For this reason he has employed a very fine, but strong, thread prepared from the Indian nettle fiber called *ramie*. This author also believes that both catgut and silk should be impregnated with an antiseptic, and he remarks that Kocher still uses silk only.

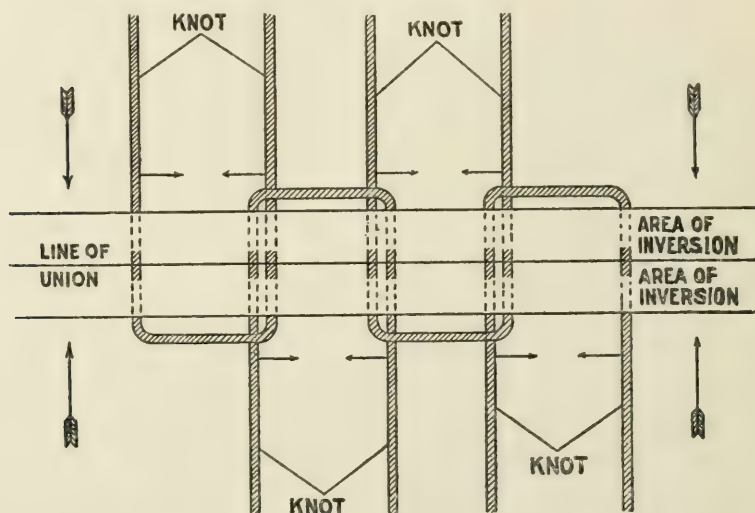


FIG. 3.—Interlocking suture with knots alternating on each side of line of union. Arrows indicate direction of suture tension. Lambert principle of inversion.

Surgical Knots. Borchgrevink,² of Christiania, Norway, gives a most interesting illustrated description of the various forms of tying surgical knots safely and quickly. It should be read in the original.

Wound Suture. Heerfordt³ shows the importance of a careful technique in closing wounds. When gloves are not worn he advocates Koenig's method of employing instruments so that the ungloved hands do not touch the suture material or the needles. If gloves are worn, this technique, which may be awkward, is unnecessary. From his experimental work he is of the opinion that aseptic suture material is better than antiseptic. I review this article to emphasize the fact

¹ Centralbl. f. Chir., 1910, xxxvii, 1.

² Surgery, Gynecology, and Obstetrics, 1910, vol. x, p. 530.

³ Archiv f. klin. Chir., 1909, xci, 198.

that a careful closure of the wound is a very important factor in its healing. A surgeon must not only be clean, but he must be gentle; traumatized tissues are weakened both for the healing process and resistance to infection. The wound must be dry. Hematomas are the chief cause of suppuration of the wound today. Proper suture approximates the tissues and obliterates dead spaces. The perfect approximation of the skin prevents the formation of granulation tissue

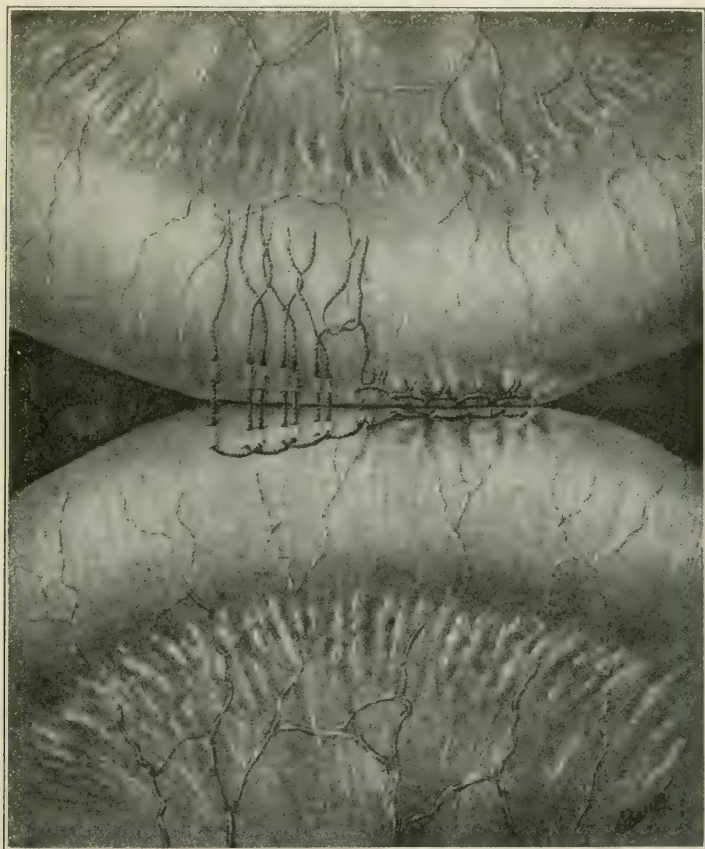


FIG. 4.—Interlocking suture with all knots on one side. Showing manner of insertion of loops, and crossing of loose ends to form the chain.

between the skin edges. This, of course, may lead to secondary infection of the deeper wound, and, in any event, interferes with perfect healing.

Turck,¹ of Jacksonville, describes and pictures his interlocking suture, which he calls a modification of Connell's suture. It is devised chiefly for intestinal work, but may be employed elsewhere. The

¹ *Annals of Surgery*, December, 1908, vol. xlviii, p. 837.

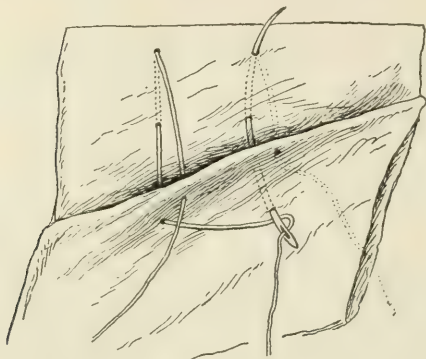


FIG. 5.—This shows the stitch nearly completed. By using a long needle and passing it through and through the stitch may be inserted very rapidly.

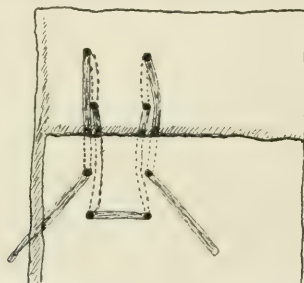


FIG. 6.—This shows the stitch in place. By tightening the suture preparatory to tying the overlapping will be accomplished.

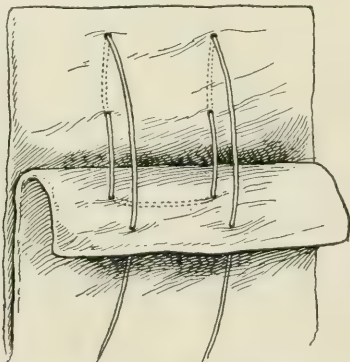


FIG. 7.—This shows the stitch in place. For purposes of demonstration the overlapping fascia has been turned back.

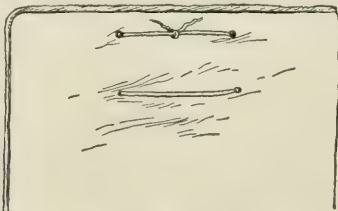


FIG. 8.—Shows the stitch tied. Note that the stitch has not been tied so tightly as to cause puckering.

suture differs from Halsted's mattress suture only in the interlocking feature (Figs. 3 and 4).

The stitch illustrated by Norris¹ (Figs. 5, 6, 7, and 8), for overlapping the fascia in abdominal wounds, I have employed for a number of years and can recommend it.

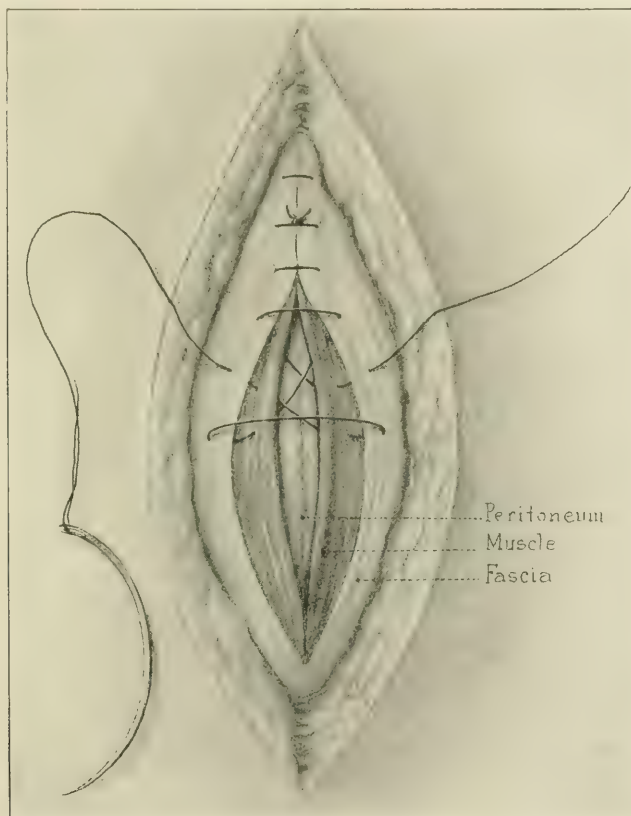


FIG. 9.—Closure of midline incision below the umbilicus. The peritoneum has been closed by a continuous suture. At the upper angle of the incision a double figure-of-eight suture has been introduced and tied, doing the work of three interrupted sutures. A second suture has been introduced, but has not been drawn taut. It shows clearly that traction on one end is transmitted directly to the upper loop, approximating the tissues included in the upper half of the suture, whereas the same result is accomplished over the lower half by traction on the opposite end. Thus, when the ends are tied there is a uniform strain on the suture, and no puckering. Two or three of these sutures suffice to close the average incision.

Richardson,² resident gynecologist Johns Hopkins Hospital (Figs. 9 and 10), pictures and describes the usefulness of a double figure-of-eight suture.

¹ Surgery, Gynecology, and Obstetrics, 1910, vol. x, p. 639.

² Journal of the American Medical Association, 1910, vol. liv, p. 1500.

Dressings of Clean Wounds. The value of Halsted's silver foil as a surgical dressing has been again called to attention by Jos. S. Lewis,¹ of the German Hospital, in New York. It is still employed as a routine in Professor Halsted's clinic by himself and all his associates. I know of no better dressing for a clean, closed wound, or as a covering for the thin Thiersch graft, or to protect the thigh after the removal of the grafts. Nothing quite substitutes silver foil when we wish to fix a collodion dressing. Combined with a little cotton it is most applicable to small wounds on the face. When I expect a good deal of oozing,

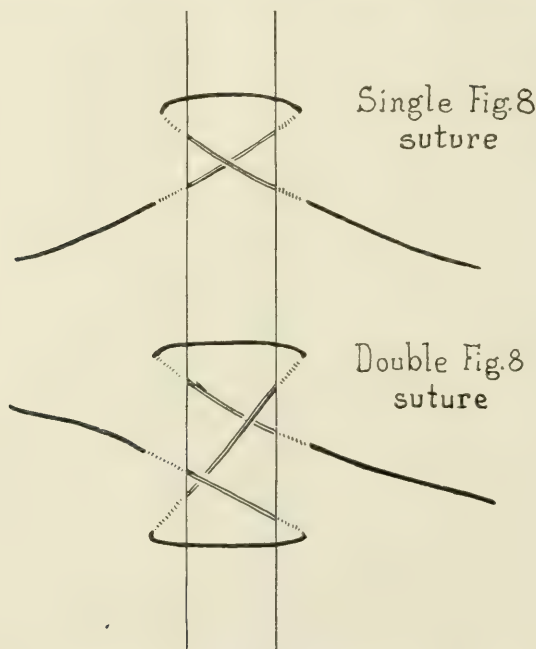


FIG. 10.—The ordinary and the double figure-of-eight suture schematically shown.

I place gauze wet in salt solution on the closed wound for the first twenty-four hours; when this dries out the wound is redressed with silver foil.

In wounds covered with silver foil from which I do not expect much drainage and in which there are no dead spaces to be obliterated by gauze packing upon the skin, I have, for a number of years, employed very little gauze over the silver foil and adhesive straps. This reduces the size of the dressing. When the wound needs a number of redressings, the adhesive straps can be cut or perforated, the perforations armed with tape giving a corset effect. Weinberger,² as shown in

¹ *Annals of Surgery*, 1909, vol. 1, p. 793.

² *Surgery, Gynecology, and Obstetrics*, 1909, vol. viii, p. 640.

Fig. 11, has devised an adhesive corset for almost every part of the body. The abdominal corset for hernia and appendicitis can be made much smaller. This method is most efficacious for certain burns and for the skin-grafting wound on the thigh. It is a procedure of value in dressing technique.

The Air in the Operating Room. Hunter Robb¹ has again investigated the air in the operating room as a possible factor in the infection of wounds, and whether the presence of electric fans increased this danger. When the floor and walls and everything else in the operating room are kept free from dust by washing with some antiseptic, the number of bacteria in the air are reduced to a minimum, and the electric fan can be kept running during an operation without causing any bacterial infection of the wound. I am sorry that Dr. Robb did not carry his observations farther to find out whether a draft from open windows communicating with dusty streets increased the number of bacteria sufficiently to justify keeping the windows closed in summer. It is my opinion that surgeons must bear in mind the possibility of infection from the air in long operations with large exposure of the wound. In such cases I am in the habit of protecting the wound with towels wet in salt solution and wrung out.

The Treatment of Accidental Wounds. The question naturally arises What shall be the additional technique when the wound has been inflicted accidentally, and the surgeon is later called upon to treat it? Here, of course, there are opportunities for infection from the skin and clothes of the patient, from external sources, the foreign body that produced the wound, and the dust and dirt in the locality in which the wound was received. Then there are wounds upon the hands of surgeons or pathologists accidentally acquired during operations or autopsies on infected individuals and material, or accidental wounds of workers in bacteriological laboratories.

The possibility and the character of infection must first be thought of. The most important is tetanus, which will be discussed again under gunshot wounds. Here the antitoxin of tetanus should always be given.

The time which has elapsed between the accident and the first dressing is another very important consideration. If one sees the wound a few hours after the accident there is nothing in the wound itself from which to estimate the amount of infection. If twenty-four hours have elapsed and there are no signs, the probability of a virulent infection can almost be excluded, but the chances of primary union from closure without drainage, if a wound has been open more than three or four hours, are so meager that one should be very careful in suturing such a wound. Reclus² prefers never to suture accidental wounds

¹ American Journal of Obstetrics, 1909, vol. lx.

² Centralbl. f. Chir., 1910, xxxvii, 367.

as a primary procedure. He irrigates with hot water under high pressure; then he covers the wound with an ointment.

FIG. 11



FIG. 12



FIG. 13



FIG. 14



FIG. 15



FIG. 16



FIGS. 11 to 16.—Photographs representing the application of the dressing to various parts of the body.

RECLUS' COMPOUND OINTMENT. Vaseline, 300; antipyrine, 5; boric acid, 3; salol, 3; iodoform, 1; carbolic acid, 1; bichloride of mercury, 10.

FIG. 17



FIG. 18



FIG. 19



FIG. 20



FIG. 21



FIG. 22



FIGS. 17 TO 22.—Photographs representing the application of the dressing to various parts of the body.

Here is a French surgeon with a huge experience in accidental wounds in Paris who prefers never to make a primary suture. He objects to any antisepsis in irrigation, but puts the antiseptics in the ointment.

American surgeons know that a certain number of accidental wounds can be primarily sutured, but for lacerated wounds, wounds that have been open for some hours, undoubtedly Reclus' treatment is the safer.

G. E. Follansbee¹ compares one thousand consecutive wounds of different types treated with 1 to 2000 bichloride solution with an equal number of cases treated with normal salt solution. He found that prolonged healing and deaths due to infection were more frequent in the series treated with the antiseptic. He is, therefore, of the opinion that the routine treatment of accidental wounds should be a dressing saturated with salt solution. In order to prevent excess of salt due to evaporation, the dressings are alternately wet with pure water instead of salt solution.

George B. Lawson² has made a study of the comparative irritative properties of some of the mercurial combinations, and finds that mercuric chloride is less irritant than the bromide or the iodide, and it is less irritant if combined with normal salt solution. In using wet dressings one must bear in mind that evaporation produces concentration and that after a time a 1 to 1000 solution may produce a dermatitis. In the large open wound, mercurial poisoning by absorption may result.

The contributions on the use of tincture of iodine all speak of its employment in accidental wounds. They depend upon tincture of iodine alone for the disinfection of the skin about the wound.

I am impressed with the availability of the tincture of iodine for the disinfection of accidental wounds when other treatment is not available. I agree entirely with Reclus that wounds should be washed out with hot salt solution under pressure, and question the value of irrigation with antiseptics, except when there is evidence of infection and when one proposes to leave the wound open; even then I am not quite sure that we have any evidence that it is any better than salt solution.

Many accidental wounds can be closed by primary suture, even when the lacerated edges must be trimmed with scissors and the knife. Tendons, arteries, veins, and nerves should be sutured primarily; if there is any doubt, all such wounds should be drained.

I agree with Follansbee that the best dressing of an accidental wound is gauze wet in hot salt solution. The hyperemia of tincture of iodine and that continued by the hot salt solution aid in the healing process of an accidental wound. In wounds on the extremities I would also employ, as an additional safeguard, Bier's hyperemia obtained with a Martin rubber band.

¹ Cleveland Medical Journal, April, 1910.

² Surgery, Gynecology, and Obstetrics, 1908, vol. vii, p. 627.

Gunshot Wounds. The accidental wounds in war give a larger opportunity than anywhere else to investigate the method which will yield the best results. The monograph of von Reyher¹ presents the problem in such a clear manner and its conclusions are so different from the commonly accepted views of military surgeons that I have critically reviewed his article *in extenso*. My limited experience with the treatment of wounds of this character agrees with von Reyher.

This seems to be a very excellent review of all the work, experimental and clinical, on the possibility of infections from fire-arm injuries.

The infections are divided into primary and secondary, early and late.

The sources of primary infection are: (1) The bore of the rifle; (2) the bullet; (3) the rags of clothes of the injured man, and (4) the skin of the man.

It has been demonstrated that the heating of a projectile does not kill the germ, and it is a question whether the heating is ever sufficient. The more modern experiments demonstrate that if the bore of the rifle, the bullet, or the clothes are infected, this infection is liable to be carried into the wound.

The author gives numerous references, but does not mention the work of LaGarde.² Experimentally it has been demonstrated that even coal dust on the bullet or in the bore of the rifle is carried into the wound. The theory, therefore, of the killing of germs has been discredited.

How often are the bullets, the clothes of the soldier, and his skin infected? It seems hardly possible that they are not infected, and experiments have demonstrated that they are. Von Bergmann's statement that the bullet is not infected was based upon the experimental work of Pfuhl and Fraenkel. Billroth, however, took the opposite view and advised the removal of rags of cloth. König was of the opinion that at least 50 per cent. of the bullet wounds were infected by the bullet or clothes.

These experiments by Pfuhl and Fraenkel, with healed-in rags of cloth on animals, do not hold in civil or military wounds, and are disproved by observations in the Manchurian campaign. Zoege von Manteuffel observed a gas phlegmon four hours after an injury of the thigh in a shrapnel wound, and I have observed this gas phlegmon in bullet wounds, reported in *PROGRESSIVE MEDICINE*, for December, 1899, and discussed by Welch in Vol. I of Dennis' *Surgery*.

Hohlbeck has shown that, in his cases of tetanus, in a large percentage the wounds contained particles of clothes. In von Reyher's statistics, among the shrapnel and grenade wounds which undoubtedly carried particles of clothes, 90 per cent. were infected. He has observed

¹ Archiv f. klin. Chir. 1909, lxxxviii, 576.

² New York Medical Journal, October 22, 1902.

three cases of wounds from mantle-covered bullets which had healed *per primam* and later developed tetanus. This is positive evidence that the tetanus bacillus must have been carried into the wounds. Zoege von Manteuffel also observed a malignant phlegmon twelve hours after a smooth wound of the calf.

Von Reyher, therefore, is of the opinion that we must always consider the possibility of infection from fire-arm injuries, even with the modern mantled bullet. Von Reyher is of the opinion that most fire-arm infections are primary, and disagrees entirely with Brentano, who takes the opposite view.

LATE INFECTION. He cites a number of cases to show that weeks, months, or years after the bullet wound, infection may flare up. That is, the bacteria remain latent for a time: An abscess from a piece of cloth twelve years after the injury; tetanus after two and five years; old wounds which reopen; and in some instances, when an operation was performed to extract a bullet impacted months before, they were surprised to find in it an encapsulated abscess. I have observed and reported the same condition with regard to silk ligatures, especially before the days of gloves when silk was handled with the bare hands.

THE CHARACTER OF THE CLOTHES. Observations have demonstrated that this, to a certain extent, is a factor. Among the Japanese, with their linen clothes, infections were less frequent than among the Highlanders in the Boer War from their woollen clothes, among the Russians with their heavy winter clothes, and especially their sheep-skin coats and fur caps. Further observations are needed on this important question.

INFECTIONS FROM THE SKIN. It is impossible to exclude this, especially among soldiers who during the war have so little opportunity for bathing, and who frequently suffer from acne and furunculosis.

Von Reyher, therefore, is of the opinion that there must be primary infection from bullet, clothes, skin or all of them, and that the now often repeated statement of von Bergmann and others cannot be considered correct.

Because many fire-arm injuries heal *per primam* is not an indication that they are not infected, but rather that the injured individual has been able to cope with the infection.

We know that the power of an individual to cope with infection varies, and this is influenced by many factors which tend to increase or lower this resistance. Von Reyher brings forward observations of his own and of others which show that a large number of wounded, with wounds of practically the same character, show a larger number of suppurations under some conditions and fewer under other conditions, for example in dry season, less infection than in wet, in summer, less than in winter; even the wounded of the successful army seem to suffer less from suppuration than the defeated.

The statements of von Bergmann and Volkmann that the "first bandage decides the fate of the patient," and that of Brentano with regard to the first transportation of the wounded, hold good, but must be interpreted differently in that not only is secondary infection prevented, but the proper bandage and proper transportation creates an environment of rest which aids the tissues in taking care of the primary infection; this is true especially in fractures.

That secondary infections do and may occur from improper surgery is true, especially in the use of the probe and in the packing of long, deep wounds with iodoform wicks; this was specially true with the Russians, who called this wick a "tourunda."

SECONDARY INFECTIONS. In ordinary civil practice air infection can be excluded, but in the presence of dust storms on the unprotected injured observed during the Boer War and during the Manchurian campaign, air infection was frequently a factor in secondary infection, and constantly had to be considered in field practice.

Flies and body lice, when present in large numbers and when the means for protecting the patients from these insects are diminished, become very serious factors in secondary infection. Even with the very sick the mouth and nose, as well as the wound, must be protected by gauze, and the dressings must be sprayed with naphthalin.

Secondary infections increase in military practice as the proportion of the wounded to the hospital corps increases. The greater the number of wounded, and the greater the difficulties of transportation, naturally, the greater the number of secondary infections.

FIRST-AID BANDAGE. This, of course, cannot prevent primary infection. According to many authorities when this bandage is put on at once as compared with later or not at all, the infections are reduced from 50 per cent. to 34 per cent. The bandage if properly applied, especially in case of fracture with fixation, is the important factor in aiding the tissues in taking care of the primary infection, and in all cases has an excellent psychical influence on the soldier.

It is a common observation of all military surgeons that the chief fault in the first-aid bandage is the absence of fixation, or its incompleteness. This is the most important detail of the first-aid bandage.

BACTERIOLOGY. In the Manchurian campaign very few observations were made, but two infections stand out prominently—*gas phlegmon* and *tetanus*. The gas phlegmon, usually localized in the thigh, was most often associated with large soft-part injuries; the mortality was high. On the whole, tetanus infection could be placed at about 1 per cent. of the wounded. Among 2225 wounded in which careful statistics could be collected, 583, or about 25 per cent., were infected, and 19, or 1 per cent. of all wounded had tetanus, or 3.2 per cent. of the infected. Of the 14 cases of tetanus observed by von Reyher, in 11 the wounds were contaminated with rags of cloth, in 3 the bullet was mantled,

in 5 shrapnel, in 6 grenade splinters, etc.; 13 cases died. The writer thinks that serum injections are of no avail after the symptoms have become manifest. He is, therefore, of the opinion that prophylactic serum injection should be employed in contaminated wounds in military practice also.

Erysipelas was very rare in the Manchurian campaign. Anthrax was more frequent and was attributed to the Russian sheep-skin fur coats, but it ran a mild course, with recovery. They observed no cases of lead poisoning from the impacted projectiles such as have been reported by Nimier, nor any copper poisoning from the copper-covered mantle projectiles of the Japanese.

In computing his own cases, which were observed in the hospital established by the dowager empress under the charge of Professor Zoege von Manteuffel, only 461 cases are available among 1162 of the wounded which were treated. This is due to the fact that during the early part of the campaign the hospital was so near the firing line and retreat was so frequent, that it was practically a bandaging station. Of the 461 cases, 119 were observations of so brief a time, due to the rapid transportation or death, that they have been excluded. Of the remaining, the 17 injuries of the spine with 11 deaths, or 66 per cent., have been excluded because the cause of death in the majority of cases—gangrenous cystitis—is more dependent upon the spinal injury than upon the primary or secondary infection.

In studying the cases he has adopted the regional division as most convenient and looks upon a perforating wound as one with a wound of entrance and exit; shrapnel and grenade wounds are considered together.

SKULL. Among 73 cases, 41, or 56 per cent., were infected—fourth place. There was absence in many cases of infection from clothing. The source of infection, besides the bullet, was the dirty scalp, the nasopharynx, and the auditory duct which often communicated with the wound specially in fractures of the base. No cases of tetanus were observed. Of the 8 cases of prolapse of the brain, 7 died. Late abscesses were frequent.

WOUNDS OF THE FACE AND THE NECK show a high mortality—18 out of 21, or 86 per cent.—second place. Here the contamination was from the nasopharynx, mouth, esophagus, and even trachea. Infection of the mediastinum and pneumonia were common occurrences.

THORAX. This is a very interesting observation and corresponds to civil practice. Among 51 cases, 28, or 54 per cent., were infected—the lowest group—all cases associated with lung injury. In practically every case the infection was associated with some foreign body—bullet or cloth. The hemothorax never suppurred without the presence of a foreign body.

ABDOMEN. He calls attention to the fact that the very severe cases of abdominal injury rarely get beyond the first transportation; they die of shock, hemorrhage, or peritonitis, so that the figures of the last receiving hospital have but a small number of wounds involving the intestines, and these, of course, are the simplest.

As a matter of fact there were 45 wounds of the abdomen with 31 deaths—a mortality of 68 per cent. It is interesting to note that among 7 cases of shrapnel injury all were infected and 2 had tetanus. All associated with perforation of the intestine died.

The primary infection of these 31 cases from bullet or rags, without injury of intestine, could be demonstrated in 19 cases. As secondary complications, perinephritic and subphrenic abscesses are common and also the suppuration of hematoma from injured kidney. The entire statistics show that primary infection, even here in the abdomen, is more common than secondary infection in the group of cases which reach the last hospitals. In one case, an ascaris worm was found in the wound of entrance.

EXTREMITIES. The figures are misleading, because in this hospital the upper-extremity wounds were apt to be transported farther and only the infected cases left, that is 35 of the upper extremity with 31 infected (88 per cent.) and 118 cases of the lower extremity with 73 infected (62 per cent.). But certain things stand out prominently: (1) There were 8 cases of tetanus among these 153 cases, while in the remaining 210 of skull, thorax, and abdomen, face and neck, there were only 5 cases of tetanus; (2) wounds of the thigh, especially with impacted projectile, almost without exception develop phlegmons, demonstrating that in this sort of wound, on account of the loose tissue, it would be wise to proceed with extraction; (3) in spite of the orders of von Manteuffel, Brentano, and others, not to suture anything on the field, primary sutures of amputations, of wounds made for extracting bullets, and other soft-part wounds were done under no antiseptic precautions, with the result that the majority suppurated.

In conclusion, he is of the opinion that his observations show primary infection to be the chief cause in not only perforating shrapnel, but also in mantled-bullet wounds, greater, of course, in the shrapnel, and greater in all non-perforated wounds.

COMPARISON WITH OTHER OBSERVATIONS. The per cent. of infections of his cases (64 per cent.) as compared with three others (12 per cent., 17 per cent., and 50 per cent.) is at first sight difficult to explain, but this is due to the same factors which influence primary infection: The lowest per cent. here was among the wounded taken care of during the best season, the next lowest among wounded farthest from the field of battle, that is, the severest wounds showed naturally the greatest number of infections and were received in hospitals nearer the field of battle. The mortality tables correspond pretty closely with the

percentage of infections, that is, among the wounded who do not die before they reach the first hospital, the chief cause of death is infection. The average mortality among these wounded is about 4 per cent.

SUMMARY. 1. Every fire-arm injury is primarily infected.

2. The per cent. for mantle is 20, for shrapnel, 62. Therefore, in 80 per cent. of the former and 32 per cent. of the latter, the tissues take care of the infection.

3. Secondary infection plays a subordinate part in fire-arm wounds, but in wounds of large caliber and those with extensive destruction of the soft parts secondary infection adds to primary infection.

4. The severest infections are primary.

5. The severity of the infection is equal to the severity of the injury.

6. The principal danger of infection in both mantle and shrapnel are fibers or shreds of cloth carried with the bullet.

7. The soldiers' clothes in the field are grievously infectious.

8. The number of severely wounded is greatest in the first field hospitals; the mortality and the severity of the infections falls with the increased distance of the hospital from the firing line.

CONCLUSIONS. Although he differs with many military surgeons as to the chief cause of infection he does not advocate, except here and there, any changes in the dressings. The first bandage should be aseptic rather than antiseptic. This is apparently correct, because if shreds of tissue and cloth and the bullet are the cause of the infection no external antiseptic dressing can help, and again, an antiseptic dressing would be more difficult for a first-aid bandage. Von Bergmann's rule of open wounds should be followed; wounds should not be closed, nor should amputations be done on the field of battle.

From his experience, he advocates that non-perforated wounds of the thigh should be opened as quickly as possible near the firing line, with extraction of the foreign material and packing of the wound.

The chief hope lies in some protective serum against tetanus, which we have, and against pyogenic bacteria and gas phlegmon which we hope for.

It is important that there should be trained surgeons and assistants as near as possible to the firing line, so that the first treatment will be in as competent hands as possible. Vessels should be ligated, wounds should not be sutured, the wound should be dressed with dry aseptic dressing, and to every such dressing a card should be attached giving in laconic form the date of the dressing, the nature of the wound, and what has been done. This is to prevent unnecessary change of dressings, which happens only too often. The next most important point is fixation dressings in fracture cases.

PREVENTIVE MEASURES. If possible, opportunity should be given to soldiers for bathing. The clothes should be disinfected at frequent intervals; there should be serum for tetanus. There were 500 deaths

from tetanus at the battle of Mukden. The crying need, of course, is a serum for the ordinary infections.

Electric Burns. Electricity is in such common use that any contribution on the treatment of electric burns should be welcome, and the first one I have run across is by Kappelman.¹ I have mentioned electricity in its relation to anesthesia and its ability to cause death. The alternating indirect current is more dangerous to life than the direct. Kappelman quotes Edson, who has said: "Contrary to what one would expect, the higher the voltage, the less the danger to life when the voltage gets up in the thousand; the nearer the current passes to the heart the greater the danger."

If the patient practically moribund from the electric current is near a hospital something should be done in an attempt at resuscitation. Of course, it must be done quickly. These patients should receive artificial respiration and cardiac massage. There is very little hope for resuscitation if the circulation has ceased longer than ten minutes. Apparently there is nothing of special importance in the dressing of the wound. As the electricity may produce necrosis, the healing may be longer than in the ordinary burn.

Burns. Neumayer² describes what he calls a new treatment for burns. It is the spraying of the denuded burnt area with *chirosoter*, a preparation which I have discussed³ as a substitute for gloves.

There is nothing new on the cause of death from burns.

In my experience, extensively burnt patients should be placed on, and covered with, a sterile sheet, given salt *per rectum*, and, if in shock, placed in a warm room with hot-water bottles under the mattress. If Henderson is correct that the shock in burn is due to the diminution of CO₂ in the blood, rebreathing with oxygen should be tried on these cases. All the older methods have failed in severely shocked burnt patients, but there is no better treatment than the open method in a cradle of sterile sheets. For burns covering less extensive areas on individuals who do not wish to stay in bed, almost any simple ointment dressing is sufficient. For cleansing of the wound, irrigation with salt solution or a bath. The moment healthy granulation tissue has formed—skingraft.

Infected Wound. The accumulated experience on the vaccine treatment of infections has been disappointing.

The principles of the surgical treatment of infected wounds have been pretty well established and have been previously discussed in these, my contributions.

Bier undoubtedly has aided us to a very great extent with his

¹ Journal of the American Medical Association, 1910, vol. liv, p. 506.

² Deutsche Zeitschr. f. Chir., 1910, civ, 615.

³ PROGRESSIVE MEDICINE, December, 1909, p. 149

hyperemia, and we find that in many instances the so-called wide-open wound is unnecessary.

I would urge upon those who have an opportunity to treat infected wounds (I see very few, either accidental or operative), to study the principles of Bier's hyperemia, which can be applied either with a rubber bandage or hot applications. Infected wounds should have moist dressings. The gauze should not stick to the granulation tissue and cause bleeding. This is prevented by ointment. Secretions should not be allowed to accumulate. In some cases the continuous bath meets the indications best. The general treatment for infected wounds is the same as for any other infection.

Surgeons today see very few infected operative wounds. Infected wounds, even of the accidental type, are uncommon. Erysipelas is so scarce that our medical students rarely see it. It has been my observation that today the treatment of infected wounds is, to a certain extent, a lost art. I use the word art because the treatment of infected wounds is by no means along scientific lines only, and it does require art based upon experience not only to save these patients from death, but to make them comfortable during the height of the inflammation due to the infection.

Balsam of Peru. That large contributions, in fact monographs, still continue to appear on the use of balsam of Peru in the treatment of accidental wounds before infection, and later as a dressing for all open wounds, and the fact that this drug was employed extensively by surgeons during the period in which they had the largest experience with open suppurating wounds, may be looked upon as evidence that balsam of Peru has some virtues over simple wet dressings or plain ointments.

Parsons¹ records his satisfactory experience with balsam oil. With this dressing, he thinks, irrigations are unnecessary and that the dressings need be changed only from forty-eight to seventy-two hours. Sickmann² reports its employment in Graser's clinic, in Erlangen. Here it is the routine dressing for recent accidental wounds. The technique is as follows: The area about the wound is scrubbed, shaved, or washed with alcohol and benzine, and then painted with tincture of iodine; while this cleansing is going on the wound has been sealed with a compress saturated in balsam of Peru; then the wound is filled with balsam of Peru and covered with dry gauze, which may be left in place for a week if there are no signs of infection. Balsam, therefore, is used to a certain extent as a substitute for tamponing the wound with gauze.

The most extensive recent contributions come from Vollbrecht³ and Jander;⁴ the latter is chiefly an experimental study.

¹ Kentucky Medical Journal, Bowling Green, March, 1910.

² Deutsche Zeitschr. f. Chir., 1910, civ, 298.

³ Archiv f. klin. Chir., 1909, xc, 502.

⁴ Ibid., p. 529.

PLATE I



Photograph of Result of Conservative Treatment in Infections of the
Hand and Fingers.

Taken one year after amputation of the index finger and its metacarpal bone for an infection destroying the tendon sheaths and involving the joints. The patient has full extension and flexion. (Bloodgood's case.)

In the first place, they make a distinct addition to the balsam of Peru technique. They add to the balsam of Peru 1 per cent. of commercial formalin (formobas). This increases the antiseptic action of the balsam without a dilution sufficient to interfere with its mechanical and chemotactic action. Larger amounts of formalin would be corrosive.

Balsam of Peru is the routine treatment of accidental wounds in the Dutch army, and, according to Vollbrecht, was employed extensively by the Japanese army during the Manchurian campaign. Vollbrecht recommends that this formobas-balsam of Peru be put up in small tubes, sterilized, and each first-aid package be supplied with such a tube, with directions to express from the tube the balsam into the wound and then put on a dry aseptic dressing.

Vollbrecht, in introducing this balsam of Peru treatment, takes the opportunity to emphatically disagree with the conclusions of von Reyher¹ as to the primary infections of gunshot wounds. The evidence brought forward by Vollbrecht is not convincing to me. My personal experience with gunshot wounds followed by tetanus and gas-bacillus infection almost convinced me that at least these two infections are always primary.

There is, of course, no doubt as to the importance of the first dressing, and everything should be done to make this as efficacious as possible, and that all means should be employed to prevent secondary infection. Nevertheless, in both military and civil practice, with both accidental and gunshot wounds, I doubt if any means employed at the first dressing will prevent tetanus, gas phlegmons, and a few other virulent infections, especially if a foreign body has been carried into the wound.

This does not mean that every wound should be opened wide and the foreign body, if any, removed. There will probably be a small group of cases, for example in injuries in the region of the rectum, and perhaps some other localities, in which it will be found best to immediately open the wound. But in every accidental wound bear in mind the possibility of these virulent infections; for a few days be on constant watch and be ready to act on the first symptom.

Never probe or interfere with an accidental wound of any character unless you have decided to open it; do nothing, or, if you decide to act, perform the operation under the most careful protection.

Now, from all this, what is the best treatment for an accidental wound? We have, first, the old method of Lister—disinfection of the wound with pure carbolic acid, now improved by the secondary employment of alcohol. Reclus is the advocate of hot-water irrigation and the mild antiseptic ointment. Numerous surgeons are employing tincture of iodine, and then we have this balsam of Peru treatment with and

¹ Loc. cit.

without the addition of 1 per cent. formalin. Then, again, the method of wet-salt dressings.

Apparently all of these methods give a good result in a large percentage of cases. Is this due to the fact that primary infection is slight in the majority of cases, and that all of these methods prevent secondary infection? I doubt if any of these methods will prevent tetanus, or a virulent infection from gas bacilli or streptococci carried in by foreign bodies.

The tincture of iodine and the balsam of Peru are the two simplest methods. I know of no better for employment on the firing line. I think these two drugs should be in all first-aid packages—on railroads, in factories; they should be carried in the ordinary medicine chest by camping parties and by anyone who leaves hospitals behind. In my own first-aid package I also always include pure carbolic acid and alcohol, but the pure carbolic acid is not a drug to be placed in the hands of the laity, while the most ignorant could be instructed in the use of tincture of iodine and balsam of Peru.

Bismuth Paste. This now well-known method of Beck, of Chicago, is employed to hasten healing of sinuses and cavities lined by granulation tissue and communicating, in some cases, with healed or unhealed tubercular foci in bones or soft parts.

The experience of Beck and others brings forward evidence of its value and it should be tried. My own experience with it is limited, but this little is favorable. The most important point to be constantly referred to is its dangers from poisoning. Even when the bismuth is obtained from the best source and in its purest state it may, if employed in large quantities, produce poisoning. This is acknowledged by all.

Emil G. Beck, in his most recent contribution,¹ describes his method of preventing bismuth poisoning. He states that among some 19 cases reported in the literature, there have been 9 deaths. In the large experience of Beck, and his brothers in Chicago, there have been no deaths.

He advises that bismuth paste be not employed to fill the cavities of acute abscesses after incision. In the first place, such abscesses heal readily, and, in the second place, there is greater danger of absorption. The possibility of absorption from a thick-walled chronic abscess is less than from the walls of younger cavities. For this reason, begin with 10 per cent. and only employ the 33 per cent. bismuth in the more chronic cases. Do not leave the bismuth in a large cavity too long. It is removed in the following way: Inject warm olive oil into the cavity containing the bismuth paste; twelve to twenty-four hours later aspirate the emulsion; do not curette.

A slight blue line on the gums is present in 20 per cent. of the cases;

¹ *Centralblatt f. Chir.*, 1910, xxxvii, 601.

according to Beck, his best results were in this group, so this cannot be looked upon as a symptom to remove the bismuth. But when the blue line becomes more marked, especially about the wisdom teeth, and there is nausea, headache, and diarrhea, immediately remove the bismuth. Apparently this procedure will always save life.

The bismuth paste can be employed in diagnosis. Injected into a sinus or cavity, an x-ray plate will show the position of the bismuth absolutely.

DISEASES AND SURGERY OF BLOODVESSELS

This chapter has much to do with the extremities. The recent successful work on the various forms of arterial and arteriovenous anastomosis has added interest to the injuries of bloodvessels, because now we may be able to save the limb by suture after an injury of its large artery or vein. In gangrene due to arteriosclerosis something may be accomplished by the reversal of the circulation, and this experimental work, too, has led to more successful operations for aneurysms.

Arteriovenous Anastomosis for Gangrene. George P. Müller,¹ of Philadelphia, in reporting his case of an end-to-end anastomosis between the femoral artery and vein at the apex of Scarpa's triangle below the origin of the profunda femoris for gangrene of the toe, collects ten other cases in which this operation was performed deliberately, with the hope of staying the progress of gangrene. Wieting² claimed a perfect result two months after operation. Hubbard's fourth case was doing well until pain demanded amputation. These constitute the only cases in which operation was done early. Four cases required amputation below or above the knee at various periods after the anastomosis. Four patients died; one from shock thirty-one hours after operation, the other three from eight to sixteen weeks later.

Buerger (quoted by Müller) writes that when the femoral artery is sutured to the femoral vein below the saphenous, the deep veins are transformed into arteries, and the blood finds its way into the capillaries and meets there the blood from the deep branch of the femoral artery. For this reason, a new centripetal flow must be established, in the main finding its way into the long saphenous, and thus into the femoral vein above the suture. Müller, in conclusion, writes that in the early stage of arterial disease producing ulcers of the toe (erythromelia), extreme pain, tingling, etc., a complete reversal of the circulation may relieve the condition if other measures have been tried and failed. When gangrene of a toe is established, one should wait for a line of demarcation. If the process involves several toes, or tends to

¹ *Annals of Surgery*, February, 1910, vol. li, p. 246.

² *Deutsche med. Wochenschr.*, 1908, xxxiv, 1217.

spread to the dorsum of the foot, an anastomosis between the femoral artery and vein with ligation of the external saphenous will almost certainly induce a line of demarcation in the region of the ankle. If the superficial or deep vein is thrombosed, the operation is useless and should not be done.

Arteriovenous anastomosis, and reversal of the circulation to prevent threatening gangrene, or to restrict it when it has begun, is still in its experimental stage.

Moszkowicz's Method. In 1908, I¹ referred to the experiments of Moszkowicz, who employed an Esmarch bandage to indicate the plane of amputation in cases of gangrene. In the extremity with normal vessels, after removal of the Esmarch there is a sudden erythema going to the end of the toe. In arteriosclerosis with gangrene, according to Moszkowicz, the level to which the erythema extends can be looked upon as the point for amputation. Bergemann,² from his experience, is not willing to confirm Moszkowicz's view. He is inclined to think that in some cases there might be an absence of this hyperemia, and yet one would succeed in getting good healing at a point below the hyperemia by careful methods. The hyperemia extending to the lower point could be looked upon as good evidence supporting the lower amputation, but the absence of hyperemia should not always be looked upon as an indication for a higher amputation. Mendelsohn³ is also of the opinion that the method may be uncertain, especially in embolic gangrene with ascending thrombosis. A very rigid femoral artery is sometimes not compressible, and the sign will fail. Of course, infection plus gangrene contraindicates the employment of the Esmarch in this way.

The problem when and where to amputate in different forms of gangrene I have so carefully considered⁴ that I will not repeat here. There is nothing new on gangrene, except the arteriovenous anastomosis, Moszkowicz's method of diagnosis, and incision, with active hyperemia to combat threatening gangrene of Raynaud's disease or trauma.

Prevention of Gangrene. Noesske⁵ in a case of Raynaud's disease with threatening gangrene of the fingers made incisions into the tissues of the fingers and employed a suction bell of Bier. The immediate result was good. He does not know the remote result. Recently, in a case of Raynaud's disease attacking the toe, I was of the opinion that I had warded off the attack of gangrene by active hyperemia produced by hot applications and the intermittent employment of the

¹ PROGRESSIVE MEDICINE, December, 1908, p. 163.

² Beitr. z. klin. Chir., 1909, lxxiii, 1.

³ Ibid., lxii, 523.

⁴ PROGRESSIVE MEDICINE, December, 1899, p. 187; 1900, p. 130; 1901, p. 188; 1904, p. 133; 1908, p. 162.

⁵ Centralbl. f. Chir., 1910, xxxvii, 424.

PLATE II

FIG. 1



Skin Grafting of Stump in Order to Preserve the Leg below the Knee.

Amputation for gangrene due to luetic arteriosclerosis fifteen years ago. Thiersch grafts.

See *Progressive Medicine*, December, 1901, page 200, for discussion of presenile gangrene. (Bloodgood's case.)

FIG. 2



Gangrene of Toes and Dorsum of Foot Associated with Arteriosclerosis and Diabetes.

White male, aged fifty years; onset five weeks. The four toes have been removed. The great toe was removed one week later. Amputation of the leg was performed six weeks later, because of sloughing of the tendons to the great toe, the appearance of general infection, and diacetic acid in the urine. Recovery. See *Progressive Medicine*, December, 1901, page 188, for discussion of the so-called diabetic gangrene. (Bloodgood's case.)

Esmarch. The patient had already lost one toe and was having attacks of intense pain with sudden bleaching of the skin of the next toe. This sudden anemia of the skin would often take place while I was examining the foot. I could produce hyperemia by active hot applications. Moszkowicz's test showed that, after the Esmarch, hyperemia extended to the tips of all the remaining toes. A few weeks later there was a recurrent attack, and in spite of treatment, gangrene of the second toe resulted. Schepelmann¹ employed Noesske's method in threatening gangrene of the finger after an operation for correcting a flexion contraction. As the removal of the bandage and the sutures did not improve the circulation, he made peripheral incisions down to the bone on each side of the finger, used the bell suction apparatus intermittently, and massaged toward the tip of the finger pushing some blood clots out of the vein. What would have happened if he had not done this, of course, is hard to say, but the gangrene which he thought was threatening did not take place.

Aneurysms. TEST TO DETERMINE COLLATERAL CIRCULATION. Dr. Matas² in his address as President to the American Surgical Association this year, took for his subject tests to determine the efficiency of the collateral circulation before attempting the permanent closure of great arteries. Contrary to the teaching of Moszkowicz (to whom I have just referred), Matas is convinced by his personal observations that the hyperemic blush is not arrested on a level with the line of obstruction or obliteration of the main trunk, but will always spread beyond it to the peripheral parts as long as the collaterals are efficient and pervious. The hyperemic test is a test of the existence of a capillary circulation in the peripheral parts regardless of the fate of the main trunk.

The test which is somewhat different from that of Moszkowicz is made as follows: For example, a patient with popliteal aneurysm is placed in a recumbent position, the femoral artery in Hunter's canal is found at a position as near the aneurysm as possible; at this point the artery is occluded with a compressor. Matas employs the compressor devised thirty years ago in the Massachusetts General Hospital. The artery having been occluded there is now no circulation except through the collaterals. There should be constant check with the finger on the aneurysm to be sure there is no pulsation. Now the Esmarch is applied from the toes to the highest level of the aneurysm and the bandage is held in place five or six minutes in older people, and ten minutes in younger. Then the elastic bandage is quickly removed, while the compressor still secures the main artery, and the wave of hyperemia is carefully watched for. First it distends rapidly, then gradually. If the hyperemic blush spreads over the entire limb,

¹ *Centralbl. f. Chir.*, 1910, xxxvii, 670.

² *Annals of Surgery*, 1910, vol. lii, p. 126.

the collateral circulation is efficient, if it does not, it is insufficient, and on this evidence the surgeon knows where the artery above the aneurysm can be ligated and the sac excised. If the collateral circulation is insufficient another method of treating the aneurysm must be employed.

The importance of this test of the collaterals is so great that I would refer to Matas' original communication for more details which lack of space prevents my going into here. But this is one of the important contributions on aneurysm. Matas' previous work and also von Oppel's investigation of the collateral circulation have been discussed in *PROGRESSIVE MEDICINE* before (December, 1908, p. 152). In this connection I would like to call attention to Momburg's method of artificial anemia by suprapubic constriction which was brought to the attention of the American Surgical Association by Gerster.¹ It has its bearing on the diagnosis and treatment of aneurysm as well as to the treatment of grave postpartum hemorrhages. The Esmarch is also employed to compress the abdominal aorta during extensive operations on the pelvis. The method is sufficiently spectacular to have attracted universal attention, and the literature is already voluminous, although the first communication of Momburg appeared only in 1908.

PARTIAL OR GRADUAL CONSTRICTION OF BLOODVESSELS. Doberauer² exposes the artery above the aneurysm and places about the artery a rubber ligature which is twisted until finally at the end of from two to four days the circulation is completely obstructed. Now, if at this time the circulation of the limb be good, permanent ligation can be made; if not, the rubber elastic can be removed, because it has been demonstrated that this method does not injure the intima nor produces thrombosis. Doberauer has employed it twice on the common iliac artery to establish collateral circulation previous to the complete excision of tumors involving the large bloodvessels in the groin. Matas employs for the preliminary occlusion of the main artery a removable aluminum band; these can remain on the vessel seventy-two hours without permanent injury.

Halsted³ has published, with illustrations, his method of partial progressive and complete occlusion of arteries by means of metal bands. The preliminary report of this work was made in March, 1905. Figs. 23 and 24 picture the ingenious instrument employed for molding the artery with the metal band.

ANEURYSMS IN YOUNG PEOPLE. Non-traumatic aneurysm is rare in young people. McGraw⁴ in reporting two cases of his own in young men, aged sixteen and seventeen years, collects others from the litera-

¹ *Annals of Surgery*, 1910, vol. li, p. 878.

² *Centralbl. f. Chir.*, 1908, xxxvi, Supplement No. 35, p. 45.

³ *Journal of Experimental Medicine*, March 1, 1909, vol. xi, p. 373.

⁴ *Annals of Surgery*, 1909, vol. l, p. 59.

ture. The possibility of arteriosclerosis in the young secondary to the various infectious diseases, and syphilis, and leading to gangrene or aneurysm, have been described in previous numbers of this journal.

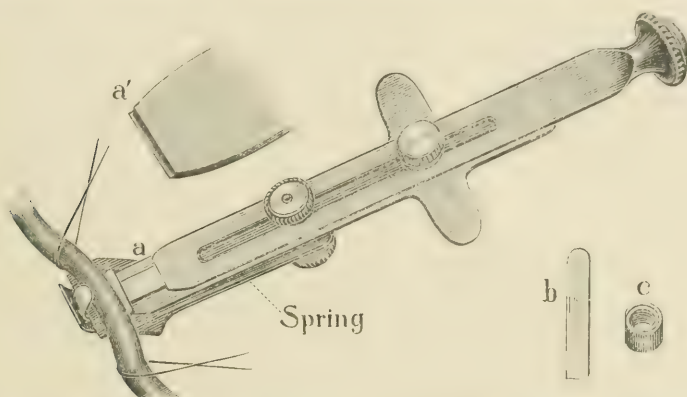


FIG. 23.—Drawn in 1905. The original band roller in the act of curling a metal strip about an artery: *a*, the tip of the driving blade enlarged; *b*, the metal strip; *c*, the band slightly tightened with the fingers as when a degree of incomplete occlusion is desired. The proportions depicted are those observed at the time the drawing was made. We should now regard the length of the metal strip as about one-third too great for its width as well as for the size of the artery represented.

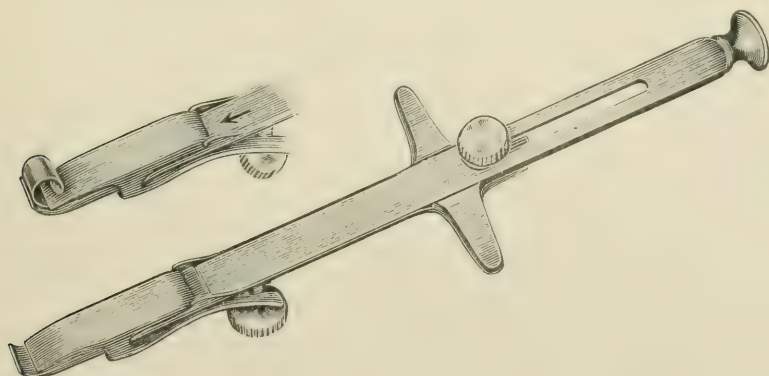


FIG. 24.—The improved band roller—the size usually employed in the experimental work. The instrument shown in full length is unloaded. In the abbreviated cut the band is about to be expelled from the roller. This band is broad enough for the abdominal aorta in man, and the diameter of the circle is too short for a vessel requiring such a broad band.

Vessel Suture. It is quite impossible to present in detail the rapidly accumulating literature upon this subject. Today every surgeon should be familiar with, and prepared to perform, vessel suture. The problems have all been worked out in the laboratory and are now available to

the practical surgeon. The technique of vessel suture will be more rapidly mastered by first attempting it on dogs.

In arteriovenous transfusion, the temporary anastomosis can be accomplished more readily by Crile's cannules or Bernheim's modification,¹ or the paraffin cannulas of Brewer. If there is no great hurry for this transfusion, here is an opportunity to educate one's self in performing an end-to-end anastomosis between artery and vein. In some cases the successful transfusion is apparently possible only through suture, as shown by the cases of Carrel and others in transfusion of very young infants.

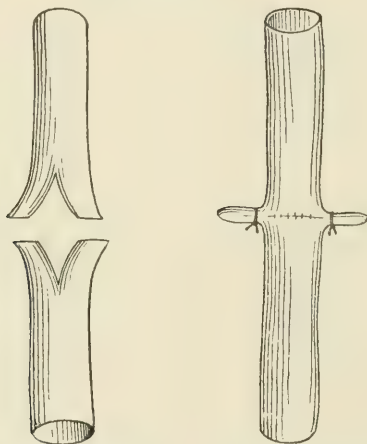


FIG. 25.—Pirovano's method of end-to-end anastomosis.

The technique of Carrel's end-to-end anastomosis I have illustrated.² Pirovano³ suggests a method which will be helpful if the caliber of the vessels is small. It is shown in Fig. 25. Each vessel compressed between the thumb and the index finger is cut in a longitudinal direction, 5 mm.; the corresponding flaps are brought together in a ligature of silk, and the portion between is united by a continuous suture of silk.

In accidental wounds we may be called upon to perform lateral and end-to-end anastomosis of the injured vessel and thereby save a limb from gangrene, or, in those rare instances of bullet and stab wounds which later develop into arteriovenous aneurysms, we may, by timely intervention directly after the accident and suture of the vessels, prevent the formation of the aneurysm. Grasmann⁴ reports the experience in Brunner's clinic in Munich on the suture of vessels in stab injuries of the extremities. The results were, on the whole, uniformly successful.

¹ *Annals of Surgery*, 1909, vol. 1, p. 786.

² *PROGRESSIVE MEDICINE*, December, 1908, p. 145.

³ *Rev. de Chir.*, xxix, No. 10.

⁴ *Centralbl. f. Chir.*, 1909, xxxvi, 1001.

In aneurysms of all kinds, resection with secondary restoration of the artery, and in some instances the vein, may be the only means by which the aneurysm can be cured and the limb saved. Victor Lieblein¹ reports a successful resection and circular suture of the femoral artery for a spurious traumatic aneurysm. In this case the vein was not included in the aneurysm and, of course, not in the operation. Previous to the operations, Doberauer's² method of temporary occlusion was tried; it was intensely painful and there was no evidence of collateral circulation, so that restoration of the continuity of the femoral artery was absolutely necessary after resection of the aneurysm. This case also demonstrated that Doberauer's method does not permanently injure the artery.

Lieblein discusses the cases which have been reported in the literature since I critically reviewed the subject in 1908. There is a more recent article by Stich.³

Lieblein makes an interesting point in technique in that he covered the area of resection and suture of the artery by a secondary muscle suture, that is, by surrounding this with muscle there is, theoretically, less probability of a scar which would secondarily contract and obliterate the vessel. This happened in Lexer's case when the artery was left subcutaneous. Lieblein also calls attention to a study of ligation of arteries by Wolff⁴ more recent than the one of Offergeld reviewed by me.⁵ Richter⁶ reports on Guthrie's method of vein suture with the employment of human hair as suturing material; he uses a No. 12 needle and sterilizes the hair by boiling.

Monod and Vanverts⁷ dealt with the subject of bloodvessel surgery before the twenty-second French Surgical Congress. They divide the topic under five headings:

1. *Contusion and Rupture of the Arteries.* In older cases nothing was done until gangrene set in, when amputation was performed. As a rule, the mortality was very low. Today an attempt is made to save the limb, and generally it is successful. The leg is kept warm, one cuts down and evacuates the blood clot, exposes the artery, which is either ligated or sutured according to the nature of the case and the artery involved. In *PROGRESSIVE MEDICINE* for December, 1899 (p. 190), I critically reviewed the communications of Schultz, Boetticher, and Meyer, and called attention to the fact that from a contusion there may be rupture of the inner coat, which later leads to thrombosis and gangrene. Here there would be no hematoma at

¹ Beitr. z. klin. Chir., 1910, lxvii, 44.

² Loc. cit.

³ Deutsche Zeitschr. f. Chir., 1908, xcv, 577.

⁴ Beitr. z. klin. Chir., 1908, lviii, 726.

⁵ *PROGRESSIVE MEDICINE*, December, 1908, p. 154.

⁶ Surgery, Gynecology, and Obstetrics, 1910, vol. x, p. 552.

⁷ Centralbl. f. Chir., 1910, xxxvii, 446 and 499.

the point of arterial injury, but the anesthesia and coldness of the limb with the disappearance of the peripheral pulse would be sufficient signs to indicate the exploration of the artery. Here one would have to resect the injured portion and perform end-to-end anastomosis. In the second form of contusion there is rupture, so that, in addition to the symptoms already noted, there is a swelling at the point of injury. Later, I¹ reported some cases which had come under my observation, and the literature. At that time surgery of the bloodvessels had not reached its present stage and the possibility of end-to-end suture after resection was not discussed.

I call attention to these two papers, because, apparently, they are the only extensive articles in English. Most frequently this traumatic rupture of the middle coat follows the contusion of a fracture. In the majority of cases the fracture is recognized, put up in plaster; the first signs of thrombosis of the vessel are overlooked; the easily recognizable picture of gangrene, when it appears on the third day, has a depressing effect upon both physician and patient. The importance of this original paper of my own, and the critical review in *PROGRESSIVE MEDICINE* was shown some years ago, when a surgeon in a Western State was sued for damages, because his patient with a fracture of the tibia developed gangrene on the third day. The patient and his lawyer claimed that the gangrene was due to a tight plaster dressing. The surgeon wrote me that he was unable to find anything in English except these two articles, and they constituted his only defense which was successful. It is very important, therefore, to bear in mind contusions with or without rupture of the artery, and the secondary thrombosis which may lead to gangrene if the operative intervention is not timely.

2. *Wounds of Arteries.* Monod and Vanwerth were able to collect 104 lateral and 21 end-to-end circular sutures. In all of these cases the suture, so far as hemorrhage is concerned, was successful, yet circulation in the injured limb was restored positively in only 23 out of 90 cases; as far as was ascertained, however, gangrene did not develop in any of the cases in which the circulation could not be restored. Signs of emboli to the periphery were present in only 3 cases. Of course, ligature is the simplest way to treat a wound of the artery, and in many cases ligature will suffice, but when a large arterial trunk is involved, and especially if the accompanying vein is also injured, suture should always be attempted. The failure of the suture because of thrombosis is as good as ligature. That must always be borne in mind. Monod and Vanwerth are of the opinion that Carrel's results with the transplantation of vessels in animals cannot be applied with the same success to man. For this reason they advise ligature when a large portion of the artery and vein is injured. I cannot agree with

¹ Maryland Medical Journal, September, 1900.

them here. If from a wound, the resection of a tumor, or an aneurysm, a large portion of the artery, with or without its vein, is destroyed, a substitution should be attempted by a vein. In some cases this vein could be sutured to the ends of the divided artery, or to the artery above and a large vein below. In all cases in which the ligation of the large artery removed gave a certain probability of gangrene, an attempt at restoring the continuity of the artery and vein should be made.

3. *Thrombosis and Embolism.* There have been 10 cases of arteriotomy for thrombosis and embolism: 2 for rupture, 1 for thrombosis, and 7 for embolisms. In all of these cases thrombosis recurred, so there was only temporary relief. Another method of operation for thrombosis—the reversal of the circulation by arteriovenous anastomosis—has been discussed, with the report of Müller's communication. Monod and Vanverts find 21 cases in the literature. Agreeing with Müller, they state that Wieting's is the only successful case.

They are rather skeptical about Trendelenburg's operation, although they think the attempt is justifiable. Nor do they think that there is much hope in thrombosis of the mesenteric arteries.

4. *Arterial Aneurysms.* In discussing this subject they do not seem to think favorably of Matas' operation¹ of aneurysmorrhaphy. As American literature has been rather slow in appreciating Matas' work on aneurysms, we should not expect more from foreign surgeons, but I am very much impressed that this operation of Matas will gain favor with experience.

5. *Arteriovenous Aneurysms.* Some form of arterial suture must in the end be the operation of choice. Even in the arteriovenous aneurysm between the carotid and cavernous sinus with its distressing pulsating unilateral exophthalmos, the ligation of the common carotid has yielded permanent results in only a few cases.

In the discussion of this paper in the French Congress, Tuffier warmly recommends Matas' operation.

The communication of Ranzi² from von Eiselsberg's clinic in Vienna brings out the point that the thrombosis of the artery associated with contusion from fracture is not always amenable to operation. In his case, although he cut down upon the artery and removed the thrombus, the gangrene was not affected, which, it is true, had already set in when the operation was undertaken. At the amputation it was found that the arteries and veins were extensively thrombosed. Perhaps, in such cases it will be found later that arteriovenous anastomosis should also be performed. Tuffier always does it for gangrene of whatever origin, and, in some cases, in the stump after amputation for gangrene, to prevent sloughing of the flaps.

¹ PROGRESSIVE MEDICINE, December, 1908, p. 146.

² Wiener klin. Wochenschr., 1909, No. 42.

Gobiet¹ is of the opinion that vessel transplantation and even vessel substitution from other animals should always be attempted in those cases in which the restitution of the arterial stream in a great vessel will save the limb.

There are two very interesting recent communications by Carrel:² The first is on latent life of arteries. In the conclusions Carrel writes: "From a surgical standpoint, the transplantation of preserved vessels can be used with safety. When the arteries were kept in defibrinated blood or vaseline and in cold storage, the proportion of positive results was 75 to 80 per cent.; and this can probably be increased." In a second paper,³ on the peritoneal patching of the aorta, his conclusions are as follows: "These experiments show that an artery can regenerate itself by using heterogenous anatomical elements. The adaptation of the peritoneal patch to the aortic wall was so perfect that the vessel, less than two years after operation, was absolutely normal."

Ulceration of Arteries. Tedenat⁴ reports five instances of this very rare disease. In all of his cases the erosion was associated with an infection, generally an abscess, about the artery. The only treatment is ligation of the main trunk, unless one can find the artery in the wound and ligate it there if the condition of its wall will permit.

This critical review of the literature on diseases and surgery of the vessels which has accumulated since 1908 demonstrates the importance of technique. Arterial suture with various forms of anastomosis, substitution and transplantation of vessels, patching of vessels—all the wonderful experimental work of Alexis Carrel and a few others—is becoming available to surgery. The technique must be acquired chiefly, at first, in experiments on animals.

SURGERY AND DISEASES OF MUSCLE

Beginning in 1902, I⁵ presented all the interesting accessible literature on this chapter.

Myositis Ossificans. Schulz⁶ studied 275 cases recorded in the German army between 1897 and 1907. The bone formation followed a single trauma in 237 cases. The most common situation was in the quadriceps femoris and internal brachial. He notes no special relation to dislocation or joint injuries. He is of the view that some cases may be

¹ Wiener klin. Wochenschr., 1909, No. 42.

² Journal of Experimental Medicine, July, 1910, p. 460.

³ Ibid., March, 1910, vol. xii, p. 139.

⁴ Centralbl. f. Chir., 1910, xxxvii, 858.

⁵ PROGRESSIVE MEDICINE, December, 1902, p. 166; 1903, p. 178; 1905, p. 245; 1907, p. 215; 1908, p. 167.

⁶ Centralbl. f. Chir., 1910, xxxvii, 798.

explained by periosteal injuries, but in other cases the bone formation is apparently primary in the muscle. Cyst formation with hematoma was frequent. He advises conservative treatment in the early bone-forming stage, consisting of rest, the avoidance of massage and motion; hydrotherapy can be employed with the rest. He warns against the use of fibrolysin. In quite a few cases there will be almost complete absorption of the bony mass with practically no interference of function.

In the second and larger group of cases, the absorption of bone is less and the interference with function greater. In these cases, when bone absorption has ceased one may interfere by operation, and large bone tumors can be removed. In the third group, the extent and rapidity of bone formation is very great, while reabsorption is very slow and incomplete. For this reason there may be greater interference with function. Operative intervention, of course, will give less relief on account of the diffuseness of the bony growth.

The cardinal point of this study of a large number of cases emphasizes the importance of non-interference in the active bone-forming stage.

Ewald¹ brings a new point in the etiology. He draws attention to the fact that the most common locations of the muscle involved in the myositis ossificans are near joints, and that dislocation is often present. He is of the opinion that the joint fluid or the synovial membrane may be the tissue which gives rise to the bone formation. Experiments on rabbits, however, failed to confirm this view. The frequency of myositis ossificans after dislocations of the elbow is well known. The internal brachial is the muscle involved. Rubaschew² from a study of six cases finds that the bone formation has no relation to the reduction of the dislocation. It may occur whether the dislocation is reduced or not.

As compared with Schultz's study of myositis ossificans in the German army, where we may infer that the individuals were of the average good health, Steinert's³ are interesting. He has collected from the literature and his own observations examples of this rare disease in patients with organic lesions of the nervous system. In two of his own cases, the ossifying myositis occurred in the arm practically paralyzed from a cerebral hemorrhage, and he finds in many of these cases that the muscle formation develops with a certain amount of spontaneity in parts with impaired innervation. The study is interesting, but the conclusions he reaches are not at all convincing. Ewald would probably use Steinert's cases of myositis ossificans near joints in patients with tabes and syringomyelia as evidence in support of his view as to the etiology.

¹ *Centralbl. f. Chir.*, 1910, xxxvii, 771.

² *Ibid.*, xxxvii, 560.

³ *Mitteilungen a. d. Grenzgeb.*, 1910, xxi, 513.

Finney,¹ in presenting six cases before the Southern Surgical and Gynecological Association, dwelt upon the importance of diagnosis. He stated that in a few instances amputation had been performed under the diagnosis of sarcoma. In the later stage of the myositis ossificans in which bone formation is evident in the x -ray, the differential diagnosis from a periosteal osteosarcoma, or an intermuscular sarcoma will not be difficult, but in the early stages, before the bone formation is sufficiently shown in the x -rays, I doubt if a differential diagnosis can be made, except by exploration. We rarely have an opportunity to make the diagnosis at this most difficult period. The delay, of course, does the patient with myositis no harm, but it is bad for the unfortunate host of a sarcoma. It is my view, therefore, if one sees these cases early, that exploration should be done. Now, if sarcoma is found, there may be a chance to accomplish a cure by an earlier intervention.

However, I would advise one to be very cautious who is not quite certain of his ability to make the differential diagnosis. The difficulty of differentiating the sarcoma from the myositis in the early stage of inflammation is great. If in doubt, do not amputate, because the chances of curing the sarcoma are too small to justify any mutilating operation, except when based upon a positive diagnosis.

SURGERY OF NERVES

Nerve Suture and Anastomosis. Alexandrini² presents a summary of the experimental and histological contribution to nerve anastomosis, with his own experiments. There is no doubt that nerve anastomosis is possible in many different ways. It has also been demonstrated that there is adaptation between the brain and the nerve, that is, in time the new nerve combination performs the function of the injured nerve fairly well. It is possible, in anastomosing between two nerves at some distance, to bridge the defect. For example, the hypoglossal can be sutured to the accessory, and the accessory to the brachial plexus. If the hypoglossal were employed as a substitute for some injured nerve in the brachial plexus, there would soon be adaptation.

Another important point brought out in this investigation is that nerve anastomosis is just as successful in a late period after injury of the nerve as immediately after it. In animal experiments, it is most successful in the young.

To show how rapidly progress is being made in the surgery of nerves I may quote, first, from the publication of Guaccero³ who reports the experience, clinical and histological, on nerve suture, from the ortho-

¹ Southern Medical Journal, January, 1910, vol. iii, p. 36.

² Policlinico, Sez. Chir., xvi, No. 4; Centralbl. f. Chir., 1909, xxxvi, 892.

³ Clinica Chir., November, 1908; Centralbl. f. Chir., 1909, xxxvi, 919.

pedic clinic of Codivilla, in Bologna, and writes that the best method of indirect nerve suture at a distance is to bridge the defect between the ends with catgut passed through a rubber tube. A. H. Tubby¹ has demonstrated that the best cylinder to carry the catgut is fresh artery. This is also brought out in the contribution of Verga.² In Codivilla's clinic, horse hair is employed for suture, and the indirect method with catgut is preferred to implantation. Verga states that nerve grafts are not as good as the substitution of an artery between the cut ends. Tubby reports, in the *Lancet* of September 4, 1909, only eight cases of nerve anastomosis—two were of traumatic origin. The anastomosis between the hypoglossus and facial gave a good result, while between branches of the brachial plexus the result was good, but not as perfect as in the other. The other six cases were of infantile paralysis, in which the time since operation has been three years or more. The results were sufficient to justify nerve anastomosis in this form of paralysis. As I will discuss later, we must choose between nerve, tendon, and muscle anastomosis, or all of these may be combined.

Wwedensky,³ in his experimental and clinical investigations on nerve healing, is of the opinion that the central theory of nerve regeneration lacks proof, that the most plausible is the peripheral; that is, there is regeneration wherever there is the sheath of Schwann, and that a central connection is not always essential.

There is no doubt that there is nerve regeneration, and the practical questions to solve is what technique or method will promise this regeneration with the greatest degree of certainty. These questions are by no means settled. There is great opportunity for both experimental and clinical investigation.

There is a collective review on nerve suture by Oberndoerffer,⁴ which considers the literature up to 1908. Then Bardenheuer⁵ has contributed practically a monograph on nerve injury, healing, and suture based upon his own experience.

Fortunately we have in English an equally comprehensive treatise by John B. Murphy.⁶ Here we are told that the first experimental attempt at nerve anastomosis was made by Cruickshank, in 1795. Reichert, professor of physiology at the University of Pennsylvania, in 1885 sutured the central end of the vagus with the peripheral end of the hypoglossal and found that the dogs showed contraction of the tongue rhythmically with each inspiration. There were other experiments before and after this on nerve anastomosis. It would take

¹ *Lancet*, September 4, 1909; *Centralbl. f. Chir.*, 1910, xxxvii, 87.

² *Clinica Chir.*, 1910, No. 1; *Centralbl. f. Chir.*, 1910, xxxvii, 653.

³ *Centralbl. f. Chir.*, 1909, xxxvi, 892.

⁴ *Zentralbl. f. d. Grenzgeb.*, 1908, xi, 307.

⁵ *Deutsche Zeitschr. f. Chir.*, 1908, xevi, 24.

⁶ *Surgery, Gynecology, and Obstetrics*, April, 1907, vol. iv, p. 443.

entirely too much space to go into all the details, and I refer to Murphy's accessible article for the points in technique up to that date (1907).

There is no doubt, therefore, that paralysis due to any sort of nerve injury should be looked upon as an indication for immediate repair by some form of nerve anastomosis or suture. It is also important to attempt nerve anastomosis and transplantation when the function of certain groups of muscles is destroyed not from a peripheral, but from a central injury, as in the paralysis of anterior poliomyelitis.

Sciatica. The discussion of a neuralgia or neuritis of this nerve will allow one to establish the principles of the diagnosis and treatment of neuralgias and neuritis of the nerves of the extremity.

In the first place, one must, with the *x*-rays, exclude some bone displacement or growth as cause of the nerve pain. In sciatica there may be bone formations associated with chronic joint inflammations as the etiological factor. When one can absolutely demonstrate a piece of bone near the painful nerve, treatment is simplified. But, in some cases the trauma may not displace bone, and even if it does not produce a fracture it may lead to laceration of the soft parts in the region of the nerve, and this secondarily to scar formation, which cannot be diagnosticated by the *x*-rays. If there is scar formation the indications for treatment are also distinct, that is, we must expose the nerve and free it from the surrounding scar. In some cases the evident scar from the soft-part wound, or the definite loss of function and sensation, are sufficient to indicate a grave injury of the nerve and justify immediate operation. But what shall we do in those cases in which pain, with or without muscular contraction, is the only symptom—where there is no loss of sensation and no paralysis?

In the majority of cases of so-called sciatica this is the rule; pain, with or without muscular contraction, are the only symptoms. It is very important in sciatica, especially in women, to exclude some pelvic tumor as the cause of the nerve lesion.

In the acute stage of the neuritis, rest is the most important therapeutic agent. When the condition becomes chronic, or when in the acute stage the pain becomes unbearable, we have some therapeutic agents which experience has demonstrated are of value. These consist of the perineural injection and the direct exposure of the nerve.

Perineural injections have been employed for a number of years, and many drugs have been recommended; for example, there is a recent collective review by Julius Flesh¹ on Schlosser's perineural injections of alcohol, and a more recent one by Pussep.² He employs a solution of 85 per cent. alcohol, 1 per cent. stovain, with ten drops of tincture of iodine per 100. His experience has been chiefly with facial neuralgia.

¹ Zentralbl. f. d. Grenzgeb., 1909, xii, 561.

² Centralbl. f. Chir., 1910, xxxvii, 252.

On the other hand, many are of the opinion that an isotonic salt solution will give equally good results. This was first suggested by Lange.¹ He employed 70 c.c. to 100 c.c. of a beta-eucaine Schleich solution in close contact with the nerve at the foramen. There are recent communications on Lange's method by Grossmann,² who prefers isotonic salt solution; by Bum,³ who also uses the normal salt solution; and, most recently, by Wiener.⁴ The latter employs salt solution chilled to 0° C. Wiener especially draws attention to the fact that after these injections with normal sterile salt solution in the region of the sciatic nerve below the notch there is usually fever within five or six hours and a chill. There have been no infections. It is claimed that this method, when employed for the pain in the early acute stage, gives temporary relief, later it often effects a permanent cure. It seems to me that it is a proper agent to employ if there is intense pain.

When time and other methods fail, then the nerve should be explored. Pers⁵ reports forty-nine operations upon patients after other methods of treatment have failed, with about 95 per cent. of cures. The operation is based upon the assumption that there are adhesions, and the nerve should be exposed, as first recommended in 1902 by von Baracz, as close to the sciatic notch as possible; the adhesions should be divided. Stretching without division of the adhesions does not give the same good results.

Some ten years ago, when I looked up the results of the surgical treatment of the different forms of neuralgia in Professor Halsted's clinic of the Johns Hopkins Hospital, I found that nerve stretching for sciatica stood out prominently with its large number of permanent cures of over three years.

I have seen a number of cases of neuritis of the sciatic nerve within the last year, and I am not satisfied that the advice not to expose the nerve until all other methods have failed is a good one, but I can find no evidence in the literature to support my view. As far as I can make out from the cases, one can be pretty certain from the symptoms within the first six weeks or two months, whether the individual has the real thing or not. Having excluded, by *x*-rays and examination, those etiological factors which are now looked upon as indications for immediate operation, we advise the patient to wait. Now he goes through his period of rest followed by a period of massage, electricity, etc., for one to two years. Then, if the relief is not forthcoming, he is given the benefit of intraneural salt solution injection. If there is a failure here, then only is he subjected to the operation with exposure of the nerve, which in the majority of cases is successful.

¹ Münch. med. Wochenschr., 1904, No. 52.

² Centralbl. f. Chir., 1907, xxxiv, 198.

³ Ibid., 1908, xxxv, 265.

⁴ Ibid., 1910, xxxvii, 912.

⁵ Surgery, Gynecology, and Obstetrics, 1909, vol. viii, p. 104.

It is quite natural to inquire whether the same operation at an earlier period would not give the same good result. To expose the sciatic, or any other peripheral nerve is a simple procedure, and it seems to me that we would save patients a great deal of discomfort and disability by earlier intervention. Experience has shown that within the first few weeks it is not difficult to pick out the cases which require months to get well of themselves, or have to be operated upon later.

SURGERY OF THE SKIN

In considering lesions of the skin of the extremity, there are a number of conditions which must be borne in mind in the differential diagnosis from the malignant lesion—the carcinoma.

Madura Foot I was able to present, in 1899, with the illustrations of Wright, who cultivated the organism. The clinical diagnosis in this case had been made by Porter. Since then I find only one other case in the literature, observed by Reynier,¹ in Paris. He informs us that the first case observed in Europe was that by Bassini, in Padua, Italy. His is the second case. Reynier's patient had had the disease thirteen years; he had never left Paris, but he was in the habit of going barefoot when he contracted the disease. It began as a boil on the sole of the foot and gradually involved the entire foot, which was swollen. There were sinuses and nodules; a nodule represented a blind sinus perforating toward the skin. The sinuses contained granulation tissue with the characteristic granule, which were cultivated as in Wright and Porter's case. From the review I could not ascertain whether the granules were of the black or orchroid type. The disease resisted all treatment until the foot was amputated. The fungus in its growth confines itself to the skin and subcutaneous tissue and does not involve muscles, tendons, nerves, or bone. It is, therefore, much less than actinomycosis.

We must be on the lookout for a Madura foot in this country because the number of foreigners from India and Africa is increasing, and our soldiers are returning from the Philippine Islands.

Delhi Boil. Since my first discussion² of this interesting skin infection, Wright, of Boston, has discovered the protozoan parasite. Bettmann and von Wasilewski³ contribute a monograph, and credit Wright with the discovery of the parasite *Leishmania tropica*. Apparently, this skin infection is observed in definite localities between 10 and 40 degrees N. latitude in the eastern hemisphere, near rivers and marshy lands. The parasite does not get into the body through drinking bad water,

¹ Bull. de l'Acad. de Méd., 1906, No. 25; Revue de Chir., 1906, xxxiv, 312.

² PROGRESSIVE MEDICINE, December, 1899, p. 175.

³ Centralbl. f. Chir., 1910, xxxvii, 825.

as Kipling suggested, but from the bite of an insect on the normal skin, or in a scratch or wound. The ordinary period of incubation is from ten to fourteen days; it may be months. There is always first a single local infection, a definite hemorrhagic point about the size of a ten-cent piece, which gradually becomes elevated into a boil. The epidermis disappears, there is crust formation, ulceration, then spontaneous healing with scar formation. The period of the disease is from six to eight months; during this time there may be other autoinfected boils, but after this immunity.

Excision in the early stage is probably the best mode of treatment, which shortens the duration of the disease, prevents other boils, and leaves less of a scar.

Perhaps, in the late stages, with large ulcers about ready to heal, not much would be gained by incision. We must be on the lookout for this skin infection among the soldiers returning from the tropics. No cases have as yet been reported from the Panama canal zone. There is a very interesting histological study by Reinhardt,¹ who describes the relation of this parasite to the tissue. Spontaneous healing with destruction of the parasite generally takes place. Markham Carter,² who has observed the disease in India, describes three forms. In the first there is a central yellow nodule with a red areola. This does not suppurate, nor form an ulcer, but disappears and leaves a scar, and is observed chiefly on the eye, chin, and lip. When it disappears here it may reappear in other parts of the body. In the second form, there is a zone of induration with an ulcer. In the third, we have the typical oriental sore. Apparently these represent only different stages of the same inflammatory reactive process, which, in the first stage, is aborted before ulceration, and in the second shortly after ulceration, while in the third it runs the full course of the disease.

Blastomycetic Dermatitis. In *PROGRESSIVE MEDICINE* (December, 1907) I pictured a fungous lesion on the skin of the leg which was difficult to distinguish from an epithelioma, and since then I have seen a few other cases on the skin of the extremity. The differential diagnosis is often difficult, even from the frozen section. There may be atypical growth of epithelium. But after seeing a few cases clinically and in the frozen section the diagnosis becomes less difficult. There is a peculiar red, healing zone of epithelium about the lesion in the gross which is not observed in carcinoma. In the frozen section, the large amount of lymphoid-cell granulation tissue and its relation to the hypertrophied epidermis suggest the diagnosis even if the parasite is not found. I am confident that this skin lesion is often looked upon as carcinoma by surgeons.

Montgomery and Ormsby³ consider the entire subject of systemic

¹ *Centralbl. f. Chir.*, 1910, xxxvii, 558.

² *British Medical Journal*, November 6, 1909.

³ *Archives of International Medicine*, 1908, vol. ii, p. 1.

blastomycetes in reporting twenty-three cases. Whenever one sees a local lesion suspicious of this infection, the possibility of a dissemination of the lesion should be borne in mind. A most careful examination of the lungs and of the sputa should be made. In the case reported by Fontaine, Haase, and Mitchell¹ the organism was easily found in the sputum and in the pus from the skin lesion (Fig. 26). The pus or

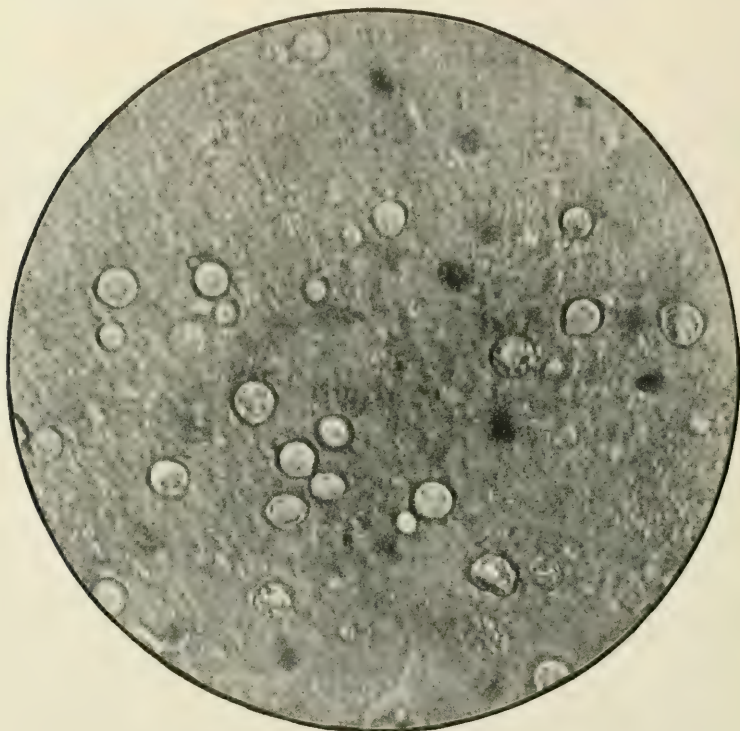


FIG. 26.—Smear of pus from skin lesion showing organism; \times 500.

sputa should be treated with a 1 per cent. solution of potassium hydrate. Fig. 27 gives a very good idea of the multiple lesion, while Fig. 28 pictures the multiple foci on the limbs in one of Montgomery and Ormsby's cases. The treatment of the systemic blastomycosis is very unsatisfactory. Early diagnosis with forced potassium iodide, tonic and hygienic measures may be helpful, at least there have been some apparent cures. Primrose² reports a few cases in which the disease was confined to the skin. There is one lesion in the region of the elbow-joint which clinically resembled tuberculosis. There should be no difficulty in the diagnosis if one bears in mind the possibility and looks for the organism. Since Gilchrist discovered the blastomyces and

¹ Archives of International Medicine, 1909, vol. iv, p. 101.

² Surgery, Gynecology, and Obstetrics, 1909, vol. ix, p. 5.

published it in 1902, there has been considerable literature, the most important of which will be found in the three references just given.

Sporotrichosis. G. Arndt¹ describes a lesion of the skin of the right forearm which is difficult to differentiate from a tubercular or syphilitic ulcer. It is the first case observed in Germany. The patient was a male, aged twenty-nine years, who first observed a red pimple on the skin of the right forearm; this rapidly covered with a scab and then



FIG. 27.—Lesions in case of blastomycosis; from photograph taken two days before death of patient.

ulcerated; extending from the ulcer were two subepidermal finger-like indurated masses which had nodules here and there; the axillary glands were enlarged and palpable. The organisms were found and cultivated on maltose agar. This disease occurs in two forms; as disseminated nodules and, as in this case, in a single focus. There are no clinical or histological characteristics to distinguish it from other chronic inflammatory nodules of the skin which lead to ulceration, except this cultivation of the organism.

X-ray Dermatitis and Carcinoma. C. A. Porter,² of Boston, contributes a monograph based upon the study of forty-seven cases. He summarizes

¹ Centralbl. f. Chir., 1910, xxxvii, 161.

² Journal of Medical Research, October, 1909, vol. xxi, p. 357.

his conclusions as follows: "With the more general recognition of the existence of these *x*-ray carcinomas it seems clear that such early conservative treatment as I have outlined will be adequate to prevent metastases, for a careful study of the fatal cases shows that in eight of them inadequate treatment, either in point of time, or extent of operation, due almost always to refusal of the patient to submit to treatment suggested, was the cause of the fatal issue. In the case of

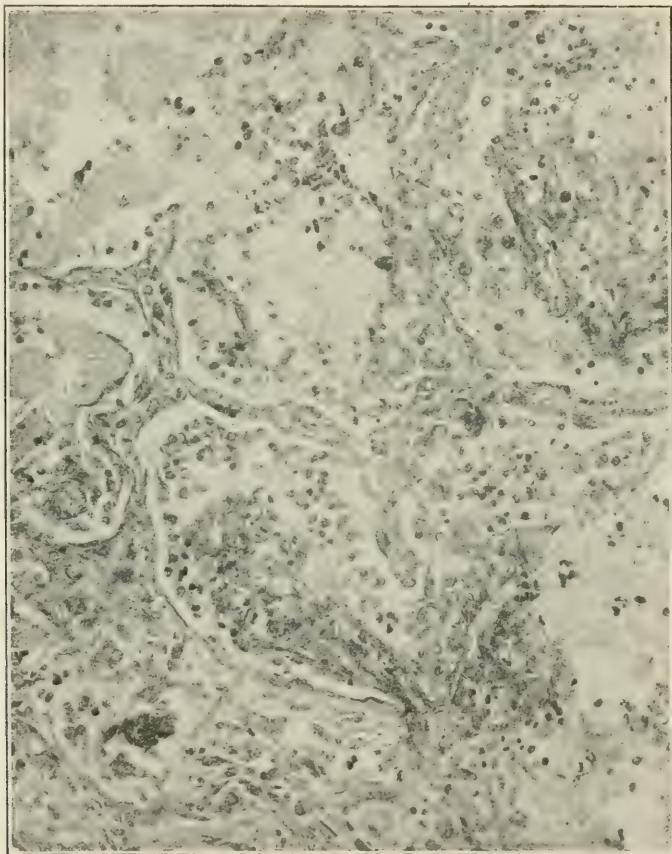


FIG. 28.—Section of lung $\times 150$; blastomycetes with connective-tissue formation and exudation.

Sick and also of Wagner coincident development of epithelioma on the face and other parts of the body made adequate surgical treatment more difficult.

As to the palliative treatment of chronic *x*-ray lesions, Porter, in general, prefers the dry method combined with protection. As to ointments, he has seen the least results with benzoinated lard; occasionally ichthyol with lanoline; orthoform should not be used. When

the keratoses are marked, they may be softened with caustic soda and shaved down with a sharp knife. He has had no experience with liquid air or carbon dioxide snow for keratosis.

I should advise anyone working with the x -ray to consult Dr. Porter's monograph for details, because apparently the palliative treatment must be varied to suit the case.

Porter expresses the opinion that today, with the modern methods of protection, one need not give up one's x -ray work. I should judge from reading his article, that the most important part of the palliative treatment is to prevent ulceration, and, if it does take place, to institute means for the immediate healing of the ulcer. Apparently the chief danger of cancer in x -ray keratosis is the formation of ulcers which do not heal. Keratoses must be kept down; they may develop into carcinoma without ulceration.

Today one working with the Röntgen rays need not fear the dermatitis, and it seems from the investigation of Porter and others that one who has acquired the lesion before the days of prevention, can prevent carcinoma by proper treatment. Porter has made a valuable contribution and has given relief, both of mind and body, to many of the pioneer workers with the x -rays.

Ingrown Toenail. A very common affection of the nail which belongs to the surgery of the skin is the painful ulceration produced by the nail growing into its surrounding tissue. In the very early stages, before there is marked ulceration, the lesion may be arrested by teaching the individual how to care for the nail and to correct a flat-foot, if present. In the local treatment I have disinfected with pure carbolic acid followed by alcohol, and then packed between the nail and the flesh silver foil and a little cotton, fixing the whole with collodion. In a number of early cases this has been successful. For example, in three cases the condition was acute after playing tennis in canvas shoes daily for one week in patients who had not taken this form of exercise for years. In a few cases I have seen it in young girls after wearing tight shoes. On the other hand, I have never succeeded in curing a chronic case by this method, but have been compelled to operate. With rare exceptions I found Cotting's method the best. In my hands it has never failed. I was instructed by Dr. Halsted in the details of this operation many years ago, when it could not be found in American text-books and at a time when the operative results of this painful affliction were not so well known. S. D. Van Meter¹ has modified the operation. A diamond-shaped piece of subcutaneous tissue is removed as shown in Fig. 29; the incision is carried to the periosteum, and then the wound is closed as shown in Figs. 30 and 31.

In this article Van Meter illustrated Anger's operation (Fig. 32),

¹ *Annals of Surgery*, 1909, vol. 1, p. 936.

Cotting's (Fig. 33), and von Bergmann's (Fig. 34). The only failure that I have experienced was in a case in which I performed an operation very much like Van Meter's. In the cases subjected to operation there is usually ulceration along the edge of the nail, and this tissue is

FIG. 29

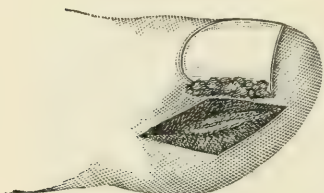


FIG. 30

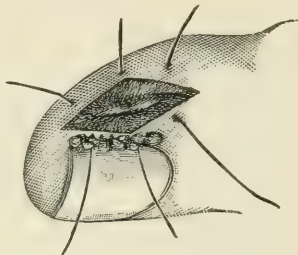
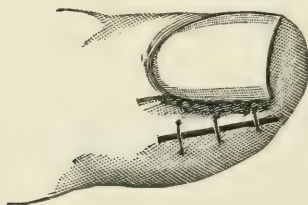


FIG. 31



FIGS. 29, 30, and 31.—Van Meter's operation.

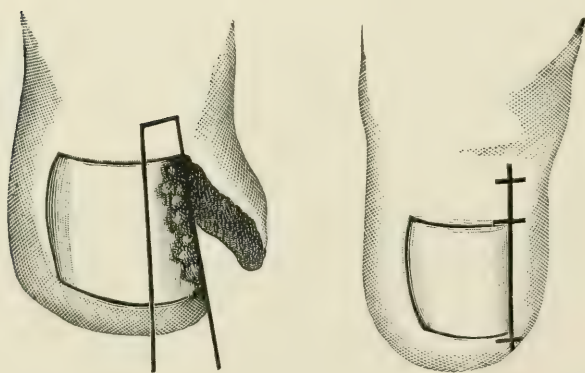


FIG. 32.—Anger's operation

not good for suture. It seems to me the most important point is to excise this tissue, and the chief factor in a successful Cotting's operation is to remove more than enough, so that in the healing process the contracting scar will draw the skin away from the nail. This operation of Cotting's can be done under cocaine, or under gas; the complete

healing will probably be longer than in Van Meter's method, and the deformity greater. I should advise one who tries Van Meter's method when ulceration is present to bear in mind the possibility of a failure and the necessity of a second operation by Cotting's method.

Lehmann¹ recommends iron chloride applied with cotton on a small toothpick. Several treatments are necessary. He claims good results.

Carbon Dioxide Snow. The literature on Pusey's method,² introduced in 1907, is increasing. The carbon dioxide snow is replacing liquid air because of the expense and difficulty of obtaining the latter. The



FIG. 33.—Cotting's operation.



FIG. 34.—Von Bergmann's operation.

best results are obtained in angiomas. Some writers recommend it in lupus, rodent ulcer, warts, keratoses, and many other superficial skin defects. George P. Jackson³ gives his experience. He recommends it for lupus erythematosus, rodent ulcer, and keloid. E. R. Morton⁴ reports a large experience with angioma—129 cases. In 87 per cent. of the superficial angiomas, one application accomplished a cure; in the deeper and larger cavernous angiomas, one application was successful in about 63 per cent. J. M. H. Macleod⁵ from his experience has not had as good results in lupus, but recommends it for nevi and rodent ulcer.

In the symposium on malignant tumors of the skin before the Dermatological Section of the American Medical Association, this treatment was

¹ Centralbl. f. Chir., 1909, xxxvi, 229.

² PROGRESSIVE MEDICINE, December, 1909, p. 203.

³ Medical Record, vol. lxxv, No. 16.

⁴ British Medical Journal, January 29, 1910.

⁵ Ibid.

considered by Pusey,¹ of Chicago. At the same symposium I presented the surgical treatment of cutaneous malignant growths,² and I would advise that this method be not employed for the malignant epithelial tumor either of the spinal or basal-cell type. Granting that carbon dioxide snow will cure a rodent ulcer in a certain number of cases, I am quite sure from my experience that the knife, with or without the cautery, should accomplish a cure in every operable case. The differential diagnosis between the less malignant basal-cell tumor (the rodent ulcer) from the more malignant spinal-cell, cannot always be made with certainty, and for this reason, if carbon dioxide snow is employed as a routine in the treatment of rodent ulcer as based upon clinical diagnosis only, in a number of cases patients suffering with the more malignant cancer of the skin will lose valuable time and, perhaps, the most opportune moment for a cure with the knife.

SURGERY OF JOINTS

Madelung's Deformity of the Wrist. Whether this can be considered a lesion of the joints or the bone makes very little difference, but it is a deformity at the wrist-joint which has a distinct literature of its own, as the deformity coxa vara at the hip-joint. For example, De Witt Stetten,³ of New York, records ninety-one references since Madelung's first description in 1878, and he collects sixty-two cases of what he calls the forward type and two which he looks upon as backward. Stetten's own case is of this rare form. The second case was reported by Kirmisson, in 1902. Stetten looks upon the lesion as an idiopathic progressive curvature of the radius. His case is illustrated by photographs and *x*-rays. There is no doubt about the curvature of the radius, and the ulna protrudes anteriorly instead of posteriorly. The curvature of the radius carries the carpus and hand backward with it. Fig. 35 illustrates the *x*-ray of the anteroposterior exposure, while Fig. 36 shows the lateral view radius against the plate. It is the exact reversal of the usual position of the ulna which is partially or completely dislocated backward, while the radius, carpus, and hand are forward. Fig. 38 is a photograph of the typical forward variety and should be compared with Fig. 39, Kirmisson's example of the backward type. Stetten's article is an unusually complete presentation of the subject.

Stokes,⁴ familiar with Stetten's work, does not employ the term idiopathic progressive curvature of the radius, but calls it spontaneous forward dislocation of the wrist-joint. Apparently his two cases were

¹ Journal of the American Medical Association, 1910.

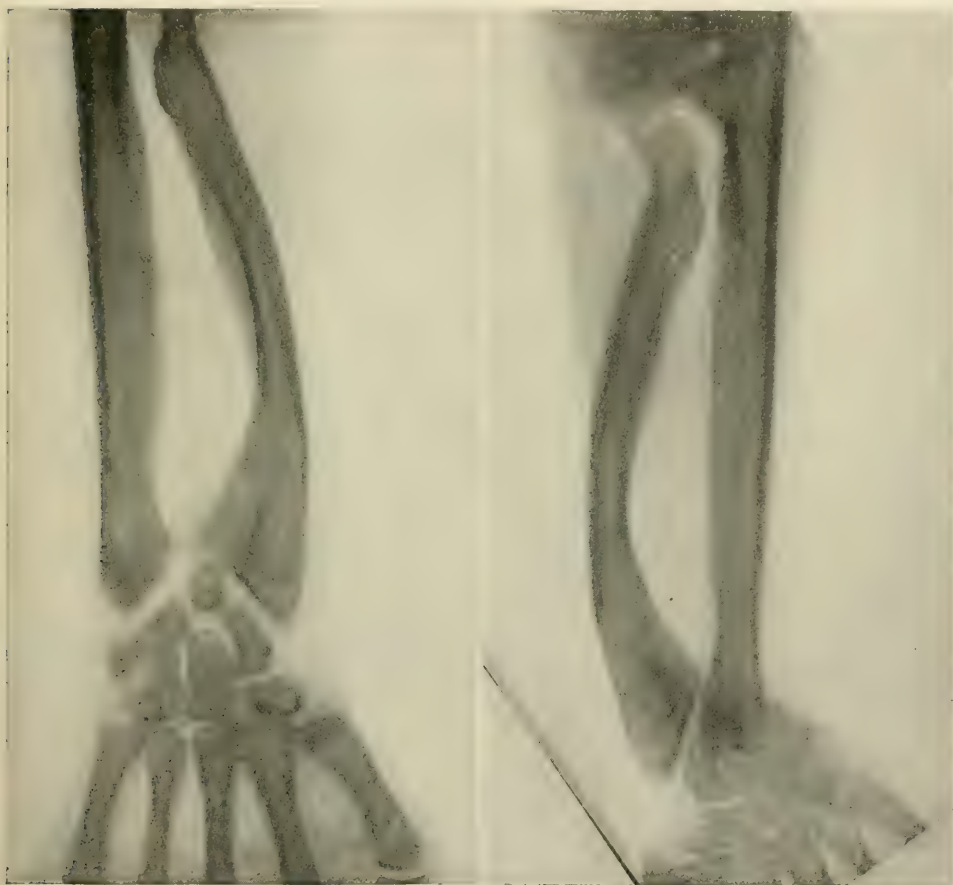
² Ibid.

³ Surgery, Gynecology, and Obstetrics, 1909, vol. viii, p. 4.

⁴ Annals of Surgery, August, 1910, vol. lii, p. 229.

of the forward type. They are well illustrated by photographs. There is a curvature in the *x*-ray of the radius in his second case.

According to Stokes, the etiology and pathology of this deformity is not entirely explained. It is observed in people of the lower classes



Right.

Left.

FIGS. 35 and 36.—Anteroposterior exposure. Dorsum against plate. Hand in pronation.

and is often associated with rickets. There is dystrophy and atrophy of the carpal bone, cartilages, and epiphyses; the diaphysis of the radius is curved anteriorly. It is most frequent in the female sex. Osteotomy with correction of the deformity is usually the operation of choice for adults; some palliative orthopedic apparatus is recommended for children.

Peckham¹ reports a case of the posterior type. The dislocation of

¹ American Journal of Orthopedic Surgery, 1907, vol. iv, p. 388.

the ulna posteriorly is very marked in the *x*-ray. In his case, he dissected the connective tissue between the ulna and carpus and, to a certain extent, relieved the deformity. Peckham's observation was congenital, bilateral. He makes no references to the literature nor to Madelung.

Gaugele¹ states that Madelung's deformity consists of a complete or incomplete luxation of the ulna backward while the radius and carpus go forward, and this deformity may have more than one etiological



Right. Left.
FIG. 37.—Lateral exposure. Radius against plate. Hand in extension and semi-pronation.

factor. In the *x*-rays of the cases reported by him, the radius shows little or no curvature, and the chief picture is the prominence of the lower end of the ulna on the posterior ulnar aspect of the wrist. It reminds one of a badly reduced Colles' fracture. Gaugele's first publication² is a very extensive one, with thirteen interesting illustrations

¹ Zeitschr. f. Orthop. Chir., 1909, xxiv, 462.

² Archiv f. klin. Chir., 1909, lxxxviii, 1058.

showing the relative position of the ulna, radius, and carpus. Stokes does not give reference to these two publications which have appeared before his.

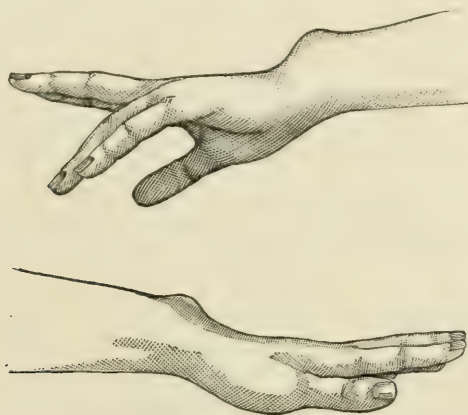


FIG. 38.—Typical example of the forward variety. Left hand seen from ulnar and radial side.



FIG. 39.—Kirrison's case.

OPERATIVE TREATMENT OF JOINT LESIONS

In the previous numbers of *PROGRESSIVE MEDICINE* I have kept up a pretty continuous story on the diseases of the joints and their treatment. There has been much said on the etiology and treatment in the

early stage. There has been very little new on the older operative methods of excision. The problem before surgeons which has presented the greatest difficulties is the restoration of function after partial or complete ankylosis.

The majority of the inflammatory diseases of joints tend to a spontaneous cure, but when they have reached this stage, the cure is worse than the disease in that there is ankylosis due to destruction of cartilage and the substitution of scar tissue for the synovial membrane.

Recognized in the early stage, most joint inflammations will yield to appropriate treatment, and function will be restored.

I wish to present this year chiefly the literature representing the attempts to restore joint function (motion) after partial or complete ankylosis.

LEXER'S TRANSPLANTATION OF JOINTS. The review of Lexer's contribution which appeared in English was discussed in 1908.¹ Since then his original article has appeared in German,² but nothing new is added, and since then I can find no further publications of Lexer upon this subject. I have mentioned also, in *PROGRESSIVE MEDICINE* for December, 1908, Buchmann's successful transplantation of the metatarsophalangeal joint of the great toe to the ankylosed elbow on the same individual. I have employed this transplantation once with a very good result. In the index to the *Journal of the American Medical Association*, Volume LIV, there is no reference to new contributions on Lexer's transplantation of joints.

Just as the manuscript is going to press the report of the German Surgical Congress of March, 1910,³ was received, and in it I find Lexer's account of his experience since 1908. He demonstrated to the Congress, first, a girl, aged twenty years, whose knee he had resected two years and five months previously. He transplanted from a fresh amputation both bones and the knee-joint with the crucial ligaments, but without the synovial membrane. The tissue healed perfectly. The patient now has fair function, good flexion, but not as good extension. On account of the extensive disease at the first resection, it was necessary to remove the patella and the ligament of the quadriceps femoris. After the healing in of the transplanted joint and when the patient had accomplished considerable flexion, two secondary operations were performed to improve the extension: first a flap turning down a piece of the rectus femoris, and then a plastic operation on the extensor longus digitorum pedis, turning it up. This makes a fair extensor apparatus for the knee.

He also demonstrated a second case, a male, aged twenty years, four months after operation. The technique was identical. The plastic operation to restore the extensor apparatus has not yet been

¹ *PROGRESSIVE MEDICINE*, December, 1908, p. 179.

² *Archiv f. klin. Chir.*, 1908, lxxxvi, 939.

³ *Centralbl. f. Chir.*, 1910, xxxvii, No. 31, Supl., p. 18.

done. In cases of this kind the patient should not bear weight for at least six months.

The question of the transplantation of the synovial membrane is not yet settled.

Then there are two cases and two specimens shown by Lexer, representing the transplantation of a larger piece of bone with only half the joint. Here we have the problem of what to do with the marrow cavity of the longer piece of bone. Lexer has given up the iodoform filling and uses a second piece of bone—the fibula is best—with its periosteum. This fresh bone acts not only as a plug to the marrow cavity, but is utilized as a pin to hold the pieces together. The specimens are interesting, because they allow a comparative histological study of the healing between the transplanted piece of bone and the patient's bone.

These cases of Lexer with the others which I will discuss under transplantation of bone only, establish the feasibility of this procedure.

Kuettner¹ reported to the Breslau Surgical Society, on March 14, 1910, a most impressive example of joint transplantation. His patient was a male, aged thirty-one years, suffering with a chondrosarcoma of the upper third of the femur which required resection of the upper third of the femur and hip-joint. A hip-joint was obtained at autopsy eleven hours after death from a patient who had died of a brain tumor. The resected hip was kept for twenty-four hours in salt solution and chloroform before it was implanted. The wound healed *per primam*. The patient was demonstrated before the Society three and one-half weeks after the operation, in a plaster dressing. The x-ray shows perfect position of the transplanted part, and there has been no local or general reaction. The ultimate results will be awaited with interest.

If joint transplantation proves to be as successful as bone transplantation the problem will be settled. It is simply a question of getting the joints at autopsy or at amputations. I am inclined to think it is this difficulty and the various minor problems of technique which have prevented the more general employment of Lexer's method.

BAER'S ANIMAL MEMBRANE. The use of animal membrane in producing mobility in ankylosed joints, is the title of the paper presented by Wm. S. Baer,² before the American Orthopedic Association, in 1909. This May (1910) I had the opportunity to see Dr. Baer's demonstration of the later results which he gave to the visiting members of the Orthopedic Association on their way to Washington. The results of an experience of two years were most gratifying.

There is considerable detail in the technique of the preparation of the animal membrane which is taken from the pig's bladder, and was

¹ Centralbl. f. Chir., 1910, xxxvii, 604; see also *ibid.*, No. 31, Supplement, p. 20.

² Johns Hopkins Hospital Bulletin, September, 1909, vol. xx, p. 271; American Journal of Orthopedic Surgery, 1909, vol. vii, p. 1.

prepared for Dr. Baer by Johnson & Johnson. The technique of introducing the membrane into the different joints is one that can be acquired only by reading Baer's cases in detail. I am distinctly impressed that this is an important contribution to the surgery of ankylosed joints, and the method should be given a widespread trial.

The method of Baer follows the principle of the transplantation of fascia between the joint ends which has been practised so extensively by Murphy, of Chicago. Kirschner¹ presents the practical results of the free transplantation of fascia not only between joints, but for other conditions such as hernia, ptosis, etc.

INJECTIONS OF FIBROLYSIN. Knotz² reports on fifteen cases with but very few definite results. Apparently his good results were observed chiefly when the ankylosis was dependent upon extra-articular scar tissue.

There is considerable literature on the employment of fibrolysin as an agent to absorb scar tissue, but some authorities warn against its employment if there is any suspicion of latent tuberculosis, because, following the injections, the walled-off tubercular process will probably become acute and disseminated.

MOBILIZATION OF JOINTS. The review of Klapp's³ paper before the German Surgical Congress, 1909, and the discussion bring up so many points of general interest in regard to the operative treatment of joints that I give it in full.

1. In tuberculous coxitis, Klapp has very frequently seen healing with motion, even with almost normal function. The treatment consisted in correction of the contracture in narcosis with the greatest possible care and caution, then plaster dressing with walking stirrup. This treatment was always ambulant, and Klapp warns against hospital treatment with extension.

2. For joint gonorrhea, only passive hyperemia is employed. In Klapp's eighty cases, incision and drainage were never necessary. Even old gonorrheal ankylosed joints recover, with mobility, under Bier's hyperemia.

3. Operative mobilization. This has so far been performed only on the upper extremity. In the elbow-joint all bony adhesions must be separated, then, to bring about diastasis, a muscle flap should be interposed. The greatest stress is laid upon early active motion. In elbow-joint fractures, especially the old, a piece is sawed off from the joint end still covered with callus and implanted on the humerus, and finally, the hook of the olecranon is resected, since it easily catches in the wrong place. In the shoulder-joint Klapp advises to saw off the head, not straight, but with a corner and to implant it into a corre-

¹ Archiv f. klin. Chir., 1910, vol. xcii, 888.

² Med. Klinik, 1909, No. 30.

³ Zeitschr. f. orthop. Chir., 1909, xxiv, 579.

PLATE III



Fracture of the Neck of the Femur. Photograph of Autopsy Specimen.

Female, aged sixty-seven years; death ten days after accident from nephritis. Investigation at autopsy demonstrated that abduction placed the fragments in perfect apposition. (Patient of Dr. McGlannan, St. Agnes' Hospital.)

For Whitman's abduction treatment of this fracture see *Progressive Medicine*, December, 1909, page 154.

sponding angle of the resected humerus. This brings about a diastasis without the loss of the pivotal and supporting point. If the capsule is very much shrunk it is removed; if not, it is left.

In the discussion of this paper Payr pointed out that in cases in which the capsular space is found atrophied, obliterated, or shrunk, the capsule should be removed *in toto*, preserving the lateral ligaments only about the hinge-joint, because the pain on motion after arthrectomy is caused by it. It is important that some soft parts be interposed between the bones.

Schulthess pleaded for energetic general treatment in tuberculous disease of the joints. A large number of the cases are then seen to heal with motion even without local treatment.

Rehn, on the whole, acknowledged himself to be an adherent of Bier's obstructive hyperemia in the treatment of gonorrheal arthritis. In some cases, however, incision is necessary, and in gonorrheal pyemia resection has to be done.

Schanz, after purely orthopedic treatment of tuberculous arthritides, has rarely seen ankylosis. It should be the aim of the after-treatment to place the mobility by means of para-articular osteotomies in the functionally most promising place. In the treatment of joint ankylosis he warns against too forcible manipulations, since these are apt to lead to wounding and scarification in the joint. In resection of the elbow-joint he recommends the implantation of a flap of subcutaneous fat. Gonorrheal ankyloses are difficult to restore to function and mobility, proper primary treatment is, therefore, the most important.

Kredel advocates chisel resection with interposition of a flap from the gluteus muscle in ankylosis of the hip.

HIP-JOINT. Lengfelter and Frohse¹ describe what they call three new methods for exposure of the hip-joint. In the review² these are described as follows:

1. Osteoplastic operation. Longitudinal incision over the trochanter major; sawing or chiselling through a bone disk about 2 cm. thick, which is later fixed back in position with silk. One patient operated on by this method was not put up in plaster and could get up eight days after operation.

2. Exposure of the outer and anterior portion of the hip-joint. Longitudinal incision descending from the anterior superior spine along the anterior border of the tensor fasciæ latæ; in the depth along the posterior tendinous attachments of the rectus to the upper rim of the acetabulum; division of the ligamentum teres.

3. Exposure of the inner side of the hip-joint. Curved incision on the inner border of the adductor longus; transverse division of the pectineus muscle.

¹ Med. Klinik, 1909, p. 1705.

² Centralbl. f. Chir., 1910, xxxvii, 106.

Fred. H. Albee¹ contributes a second report on his new operation for arthritis deformans and other deformities of the hip. The first publication appeared in 1908, when he reported four cases. Since then he has had nine further cases. He points out that resection of the upper end of the femur gives very unsatisfactory results. His object is to produce a painless ankylosis. The principles of the method are illustrated in Figs. 40 and 41. The joint is exposed by the usual anterior intermuscular incision; access to the joint is helped by abduction of the limb; having exposed the head and acetabular cavity, the piece of bone illustrated in the figure is removed; the limb is fixed in abduction and ten degrees of flexion.

I² have frequently employed a method similar to this in ankylosis of the hip rather than perform resection or a subtrochanteric osteotomy.

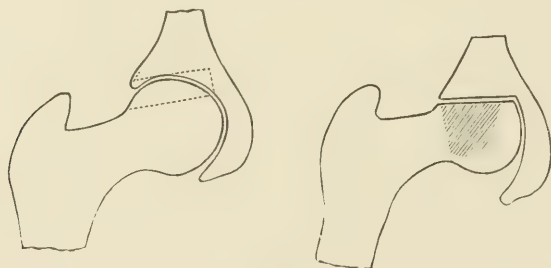


FIG. 40.—The broken lines indicate the amount of bone to be removed. It is removed from the head and the acetabulum in different planes in order to secure the desired abduction of the thigh, when the freshened bone surfaces are brought together.

FIG. 41.—Apposition of the freshened bone surfaces after the removal of the bone from the head and the acetabulum and the femur placed in slight abduction. The blackened area indicates where the cartilage is removed when the femur is strongly rotated outward for that purpose.

KNEE-JOINT. Lauper³ presents a new method for conservative arthrotomy. There is a long oblique incision on the inner lateral side of the joint from a position about the joint line to the vastus medialis muscle; more room is gotten by making the incision oblique rather than longitudinal. The incision begins from posterior above to anterior below, the joint is opened without cutting ligaments or muscle; now there is a separation of the periosteum with the joint capsule for a short distance over the anterior surface of the inner condyle of the femur. With this relaxation one can pull the patella over on the external condyle of the femur; at this point the knee is flexed and, Lauper states, an unusually good exposure is given for the removal of loose cartilages,

¹ Surgery, Gynecology, and Obstetrics, 1910, vol. x, p. 256.

² PROGRESSIVE MEDICINE, December, 1900, p. 221.

³ Centralbl. f. Chir., 1910, xxxvii, 821.

dislocated menisci, and inspection of everything, except the inner condyle of the femur. In my experience one can remove the meniscus or suture, remove villi and loose cartilages through a less extensive lateral incision combined now and then, when the villi formations are extensive, with an external lateral incision. So that this good exposure of Lauper is not really necessary when the operative lesion is distinct. But in cases where we wish to inspect the entire joint, Lauper has undoubtedly added a method which will be found most satisfactory, and the healing of the wound and the convalescence will be just as rapid as after a simple incision without dislocation of the patella. This allows us as good an inspection of the joint as after sawing through the patella.

Klapp¹ proposes a very ingenious method for partially ankylosed knee-joint. It is based on the observation that the adhesions are chiefly anterior and that the cartilage on the posterior condyle of the femur which comes in contact with the tibia only in flexion is preserved intact. He, therefore, under ether, forcibly breaks up the adhesions and flexes the leg on the femur; this brings the tibia in contact with the posterior part of the condyle, then he performs a cuneiform osteotomy from the femoral epiphysis and extends the limb. The fragment is nailed in place and the nail is removed in about six days. He reports one successful case, and a second one, too recent to judge of the result. Baer would claim that a joint in which Klapp's operation was possible would be an ideal one for his interposition of animal membrane which appears as a less formidable operation.

G. G. Davis,² of Philadelphia, gave a preliminary report on his method of resecting the knee with the object of obtaining a movable joint. The patients, to walk, have to wear an apparatus with the joint at the knee and ankle. I have seen some of the results obtained by Davis, and for certain occupations they are much more satisfactory than a stiff knee. Davis attempts to get a fibrous ankylosis, after resecting the knee, as in the elbow. In addition to this the head of the tibia is made concave, while the femur is convex. Between the bone ends previously prepared flaps of fascia lata are placed.

When a knee must be resected for disease, the patient should be given the choice between a stiff strong limb on which he can walk without apparatus, or a movable, but weaker, joint, one which will have to be supported by an apparatus during walking. I have seen no further report from Davis since this article.

ELBOW-JOINT. The results of excision of the elbow, on the whole, are good. If too little bone is removed there is some danger of ankylosis from bony union; if too much bone is sacrificed then there is some

¹ Zeitschr. f. orthop. Chir., 1909, xxiv, 631.

² American Journal of Orthopedic Surgery, April, 1907, vol. iv, p. 7.

risk of a flail-joint. In my experience there is no question that in complete ankylosis of the elbow the functional results after a proper excision is always an improvement. I am confident, however, that with certain technical methods one can increase the range of motion and yet preserve the strength of the arm.

In cases in which the injury or disease has not produced ankylosis, but only restriction in extension or flexion, one must be very careful about advising operation, unless one is familiar with these technical methods which allow motion without detracting much from strength, and even then there is a certain risk that in the endeavor to give the individual more motion at the elbow the strength of the arm will be impaired. It is quite impossible to make a general rule for all cases, but I repeat, when there is ankylosis there is no question but you can promise the patient an improvement. When there is only restricted motion with great strength, be very careful about proceeding with operation if the patient prefers strength to more motion.

H. R. Wharton¹ presented a patient before the Philadelphia Academy of Surgery whose elbow he had resected fifteen years before. The operation was performed for an old fracture of the condyle with posterior dislocation. The functional result was a good one, but the actual details of range of motion and strength are not given in the report. Wharton is of the opinion that one should remove the ends of the bone freely, but preserve the attachment of the triceps to the ulna, and after resection to carefully suture the divided triceps tendon. The methods of Murphy and Helferich, which consist of placing muscle, periosteum, or fascial flaps between the bones, allow the surgeon in resection of the elbow to preserve more bone if it is not diseased, and thus get as great motion with less loss of power.

Scudder² reports such a case. There was complete ankylosis after fracture. Only sufficient bone was removed to fashion a fairly naturally shaped elbow-joint. Between the bone ends a fascial flap was introduced. Baer would have introduced his membrane. The result in Scudder's case is unusually good. There is almost complete flexion and sufficient extension to suit any individual. The exact strength is not given. I cannot agree with Scudder that a flail-joint follows an ordinary excision, but I am confident that motion without loss of power is increased by preserving the tendinous attachments of the muscle by removal of less bone when possible, by the introduction of a muscular or fascial flap or animal membrane (Baer), and by accurate suture of the divided triceps tendon. I have not been able to convince myself that there is any advantage in the preservation of the olecranon, in fact, in some cases it is a disadvantage (see Klapp, *loc. cit.*).

Hans Reiner³ describes the results obtained in Bier's clinic after

¹ *Annals of Surgery*, 1910, vol. lii, p. 272.

² *Ibid.*, 1908, vol. xlviii, p. 711.

³ *Deutsche Zeitschr. f. Chir.*, 1910, civ, 209.

resection of the elbow-joint by Helferich's method. There were twenty-eight operations between July, 1907, and 1909, but Helferich proposed his method in 1894. Reiner urges that, in tuberculosis, the foci of the disease be well and radically removed by incision through healthy tissue. In ankylosis from other causes—fracture, non-tubercular inflammation, etc.—all bony growth and osteophytes should be removed. The lower end of the humerus is made convex, while the radius and ulna are made concave; then there is a muscular fascial flap fashioned from the radial side of the triceps and introduced and sutured between the bones. The after-treatment is as important as the operation. For eight days the arm is kept in extension, then there are daily dressings, with hyperemia by hot air, massage, active and passive motion, and at each dressing the elbow is fixed at a different angle. One can see here that the good results depend also upon the good-will of the patient. The treatment is trying, tedious, and often painful, but the result obtained justifies the means employed.

SHOULDER-JOINT. Scudder and Barney¹ report on the late results of nineteen cases of excision of the shoulder-joint. They found that following excision of the upper end of the humerus there will be limited power in the shoulder; a distinct diminution in strength; limited active motion in abduction and adduction, and in anterior and posterior swing; muscular atrophy, and, possibly, the formation of plaques of new bone about the old joint from detached periosteum. These species of new bone may seriously impair motion. Deformity and pain may follow an excision of the shoulder-joint.

There is no doubt, therefore, that in dislocation or fracture, reduction should always be attempted first. Of course, excision is better than ankylosis, but one should make the attempt and resect later if ankylosis takes place. Scudder feels that excision is often done in fracture or dislocation, because it is easier than reduction.

Loose Joint Bodies. *OSTEOCHONDRITIS DISSECANS* (KOENIG), *ANEMIC INFARCT* (LUDLOFF). Kirschner² brings the literature on this subject up to 1909. He reminds us that the first joint body was described by Paré, in 1558. At the present time all authorities agree that trauma is an etiological factor in a large number of cases, but the question is how to explain those cases in which there is no positive history of a trauma. Koenig, in 1888, first described a process which leads to the separation as *osteocondritis dissecans*. In 1899, his student Martens again brought up this subject, and in 1905, Koenig discussed it and reiterated his views.³ Barth, in 1898, and Vollbrecht take a view that trauma is the etiological factor in all cases. I have reviewed these articles in *PROGRESSIVE MEDICINE*, December, 1899, p. 203.

¹ *Annals of Surgery*, May, 1909, vol. xlix, p. 696.

² *Beitr. z. klin. Chir.*, 1909, lxiv, 417.

³ See *PROGRESSIVE MEDICINE*, December, 1906, p. 249.

Ludloff takes a medial view between Koenig and Barth, that there is both trauma and the osteochondritis dissecans. He is of the opinion that the latter is due to an anemic infarct caused by thrombosis of the terminal artery. Kirschner's case resembles Ludloff's two cases, but the condition "osteochondritis dissecans" or the "anemic infarct," of Ludloff, has not been proved beyond a doubt.

Kirschner points out that the predilection for the formation of the loose body is on the outer side of the internal condyle, near the attachment of the posterior crucial ligament. This I have pictured in *PROGRESSIVE MEDICINE*, December, 1899, p. 205, Fig. 19, taken from Barth.

Kirschner shows an *x*-ray, and states that in all cases the *x*-ray shows the defect at this place. This, therefore, can be used as a means of early diagnosis.

Ludloff¹ goes into his theory and gives fourteen pictures, eight of which are *x*-ray sketches which show the defect. He also gives references to the most important literature which I have previously discussed in *PROGRESSIVE MEDICINE*.

Buedinger² is the most recent advocate of Barth's purely traumatic view. He calls attention to a traumatic rupture of the cartilage which may heal spontaneously, or which may lead to partial or complete separation. The most frequent situation is about the condyles of the femur and the patella. This cartilage separation may be associated with hypertrophy of the fat about the patellar ligament. A clinical diagnosis cannot be made. When the symptoms indicate it, the joint can be exposed for full inspection by division of the patellar ligament and turning up the patella.

Ernst Ruge³ publishes an article on "Numerous free joint bodies in isolated arthritis deformans of the cubital fossa." This will be discussed under arthritis deformans. He shows two good *x*-rays showing multiple bodies about the elbow-joint.

Healing of Cartilage. Cramer⁴ gives a historical review, then his experiments, which had to do with the infliction of small aseptic cartilage defects. He finds that in small cartilage defects there is no difference in the wound three days and three months after its infliction. The defect is filled with fibrin and nuclei from the blood or cartilage connective tissue, but the cartilage cells show practically no change and no karyokineses. There is, therefore, no healing of aseptic cartilage wounds in the sense of a union of cartilage by its regeneration. However, when the wound is carried to the bone, or synovial membrane, the defect is filled by regeneration from those tissues.

¹ *Archiv f. klin. Chir.*, 1908, lxxxvii, 552.

² *Deutsche Zeitschr. f. Chir.*, 1908, xcii, 510.

³ *Archiv f. klin. Chir.*, 1909, xci, 227.

⁴ *Zeitschr. f. orthop. Chir.*, 1908, xxii, 172.

Villous Arthritis. Lipoma Arborescens. Rammstedt¹ brings this subject up to date. He calls attention to the fact that it was first emphasized in 1904 by Hoffa, and the pathology of the villi was studied by his assistant Becher. C. P. Flint,² of New York, has reported some interesting cases with good illustrations, showing the ligamenta alaria and the villous arthritis.

This condition must be looked upon as a form of traumatic arthritis; it is most frequent in the knee-joint.

Following severe, slight, or repeated trauma, or even overexertion, certain traumatic lesions of the knee-joint may develop: loose bodies, dislocations of the meniscus, rupture of the crucial ligaments, chronic arthritis with effusion, but the most frequent result is this villous arthritis in its various forms. There may be a single lipoma, a few villi, or the entire joint may be covered with these fringes. They are most common in the region of the patellar ligament. Clinically, the patients complain of pain, which is always increased by exertion, and there may be sudden attacks of pain of great severity. There is early fatigue after exertion, but rarely much restriction of motion. There is swelling due to effusion, now and then upon palpation soft masses to each side of the patellar ligament may be felt, or the synovial membrane may be thickened. Upon aspiration the effusion in some cases is bloody, but usually serous.

Upon exploratory arthrotomy, the villi are easily seen and removed, always with a good result.

Meisenbach,³ in his cases, was able to show the irregular shadows in the *x*-ray. In one, besides the hypertrophied villi there was a free body, in another an exostosis.

Traumatic Arthritis. Cecca,⁴ in a series of experiments, demonstrates that the cartilage is a protection against the invasion of microorganisms from the bone, and they cannot invade this way unless the cartilage is destroyed. But the organism may reach the joint from a bone focus in ten to twelve days through the synovial membrane which acts as a passive filter. Trauma favors such an invasion. If iodine is injected into the knee-joint, it appears in the urine in from fifty to ninety minutes. Cecca feels that any chemical irritant is, therefore, contraindicated.

Hoffa⁵ has shown that the etiological factors are: (1) Trauma from without, which may be a single one, slight or severe, and repeated very slight traumas; or, (2) from within, as free bodies, loose or dislocated menisci, loose joints, arthritis deformans. I would add tabes dorsalis with its arthritis.

¹ Archiv f. klin. Chir., 1909, lxxxix, 173.

² Annals of Surgery, September, 1905, vol. xlii, p. 445.

³ Buffalo Medical Journal, March, 1908; review Centralbl. f. Chir., 1908, xxxv, 608.

⁴ Clinica Chir., 1907, No. 7; Centralbl. f. Chir., 1908, p. 257.

⁵ Centralbl. f. Chir., 1906, xxxiii, 592.

In the beginning there is always effusion associated with swelling of the synovial membrane. This at first is most marked in certain areas of the joint, especially in the region of the folds, recesses, and about the patellar ligament. There is a diffuse lymphocytosis, most marked about the bloodvessels; later there may be mucoid and hyaline degeneration, then villi formation, up to a point of lipoma arborescens. The diagnosis can usually be made. X-ray after inflation of the joint with oxygen will always make it. Conservative treatment with fixation and rest may be tried first, and if this fails, partial arthrectomy always accomplishes a cure. Among his forty-three cases there was one ankylosis from infection.

RUPTURE OF THE CRUCIAL LIGAMENTS. Fritz Koenig¹ reports three cases of injuries of the crucial ligaments. The symptoms are bloody effusion. The treatment should consist of aspiration followed by fixation for at least three weeks, and in severe cases an apparatus with a movable joint should be worn. When this treatment is not followed, the condition becomes chronic, villous arthritis becomes a secondary change, and operation is indicated to remove the villi, followed by a longer fixation. Now and then a piece of bone will be torn off with the ruptured ligament. This will be seen in the x-ray, and is an indication for longer fixation.

INJURIES OF THE MENISCI, OR SEMILUNAR CARTILAGES. I have discussed this frequently in *PROGRESSIVE MEDICINE*. In December, 1907 (p. 174), I reviewed Koenig's communication, and in December, 1909 (p. 174), Dambrin's monograph. In the *Annals of Surgery* (December, 1909, vol. 1, p. 969) Robert Jones, of Liverpool, presents a classical article on Derangement of the Knee, with the following headings: Anatomical Injuries of the Cartilage and Meniscus, which must be distinguished from synovial fringes (chronic villous arthritis), loose bodies, lipomata, osteomata, rupture of the crucial ligaments. The exostosis and osteoma can, of course, be recognized in the x-ray. Then one must consider separation of small bony fragments from the condyles, fracture of the beak-shaped process of the tibia, recurrent dislocations of the patella.

When operating upon the knee it is placed in a flexed position on the end of the table. All these conditions must be differentiated from traumatic arthritis.

In reference to exostoses, Peiser² describes a number of cases of typical periosteal exostosis on the inner condyle of the femur after a joint injury.

Pneumococcus Arthritis. Zesas³ report may be looked upon as the most complete monograph giving the literature up to date. There is

¹ Centralbl. f. Chir., 1907, xxxiv, 493.

² Archiv f. klin. Chir., 1909, xc, 249.

³ Zeitschr. f. orthop. Chir., 1909, xxiv, 129.

no doubt that the arthritis occurring during, or shortly after, pneumonia is a blood infection. This has been established by pure cultures. When the arthritis occurs early in a pneumonia the prognosis is bad, the mortality is 75 per cent. When it occurs during convalescence or later, the prognosis is better, the patients generally recover, although in some cases the joint may become ankylosed. The infection is often pure, it may be mixed with staphylococci, and in a few of the late cases only the staphylococci are found. Here it is considered that the pneumococci have died out. As a rule, the shoulder is most frequently involved, and if the lower extremity is attacked it is the knee. The pus may be serous or purulent. A positive diagnosis is only made by culture. Aspiration should be the first therapeutic measure; if this fails, arthrotomy with irrigation, and if this does not relieve, search for a bone focus. In the very purulent cases the functional result has not been good, but it seems to me that in these cases surgery has been instituted late.

Gonorrheal Arthritis. In *PROGRESSIVE MEDICINE* for December, 1900 (p. 174), I have discussed gonorrheal arthritis very thoroughly from the standpoint of diagnosis by aspiration and cultivation of the gonococcus, and treatment by arthrotomy and irrigation, when the exudate contains the gonococcus. In *PROGRESSIVE MEDICINE* for December, 1902 (p. 134), I again discussed this question. In recent literature we find chiefly the discussion of gonorrheal arthritis by obstructive hyperemia, by vaccines,¹ and by dead gonococci.²

GONORRHEAL ARTHRITIS IN INFANCY. Gustav Drehmann³ describes a typical joint infection which occurs in the early weeks of life. It is associated with swelling and contraction, usually involves hip or knee, rarely the wrist or elbow. There are two types: In one, suppuration takes place early with spontaneous rupture of a thin mucoid pus, or the apparent extra-articular abscess is incised; in the other form, the swelling goes on for some weeks and then gradually subsides with apparent restitution of the joint. In the majority of text-books and articles, the prognosis is looked upon as good. It can be differentiated from syphilitic arthritis of young infants from the fact that this is usually multiple, involves the upper extremity and, while the local symptoms are slight, the loss of function is great; it has been called pseudo-paralysis due to osteochondritis syphilitica dessicans. In the syphilitic cases treatment gives immediate results. Untreated cases go on to suppuration with deformity due to bone destruction and contraction.

In this infantile non-syphilitic inflammation, after the apparent restitution to normal, there may be later deformities.

As to etiology, it is obscure. Such joints are not syphilitic, nor

¹ Hartwell, *Annals of Surgery*, 1909, vol. 1, p. 939.

² Irons, *Archives of Internal Medicine*, 1908, vol. i, p. 433.

³ *Ztschr. f. orthop. Chir.*, 1904, xiii, 272.

tubercular, and in his cases there was no history of a gonorrheal ophthalmia neonatorum.

Such joint inflammations do occur in infancy. They were first described by Lucas in 1885; on the sixteenth or eighteenth day after the healing of the blennorrhea joint symptoms come on; there is generally spontaneous cure in from four to eight weeks.

It is very interesting to note that Renel and Kimball¹ report eight cases of arthritis in infants, aged five to ten weeks, with no ophthalmia and no urethritis; six died. The pus contained the gonococci. They are of the opinion that the gonococcus entered through a stomatitis or an inflammation of the upper respiratory organs.

Gonorrheal arthritis, therefore, may take place in infants through unusual portals of entrance. At the same time other organisms may produce local inflammations in the eye or in other places, and be associated with arthritis. They may be the pneumococcus or the bacillus coli.

The point that Drehmann makes is that arthritis in infants may frequently be due to the gonococcus without an apparent portal of entrance, but all arthritides following ophthalmia of infants are not necessarily gonorrheal.

His paper deals chiefly with the later deformities at the hip, which come on after the child begins to walk, dislocation or coxa vara. He adds nothing to the etiological factors, so his cases may be studied under gonorrheal arthritis in infants.

Gout. His² is of the opinion that gout can be diagnosticated by changes in the purin metabolism. If this is absent, it is not gout. The treatment is a milk and vegetable diet.

Arthritis Deformans. ETIOLOGY. G. A. Wollenberg³ from the histological study, finds such marked changes in the walls of the vessels that he looks upon this obliterating endarteritis as a factor in the disease. He recognizes five clinical types: (1) Traumatic; (2) secondary to joint rheumatism; (3) metastatic carcinoma in the vertebræ; (4) associated with deformities such as congenital dislocation of the hip; (5) idiopathic.

In Nos. 1 and 5 he finds similar changes—marked sclerosis of the vessels, cartilage formation in the synovial membrane with later free joint bodies, foci of subchondral osteitis fibrosa with cystic degeneration, zones of hyperemia, and sclerotic bone. Cyst formation, of course, has been described by Ziegler and others in arthritis deformans.

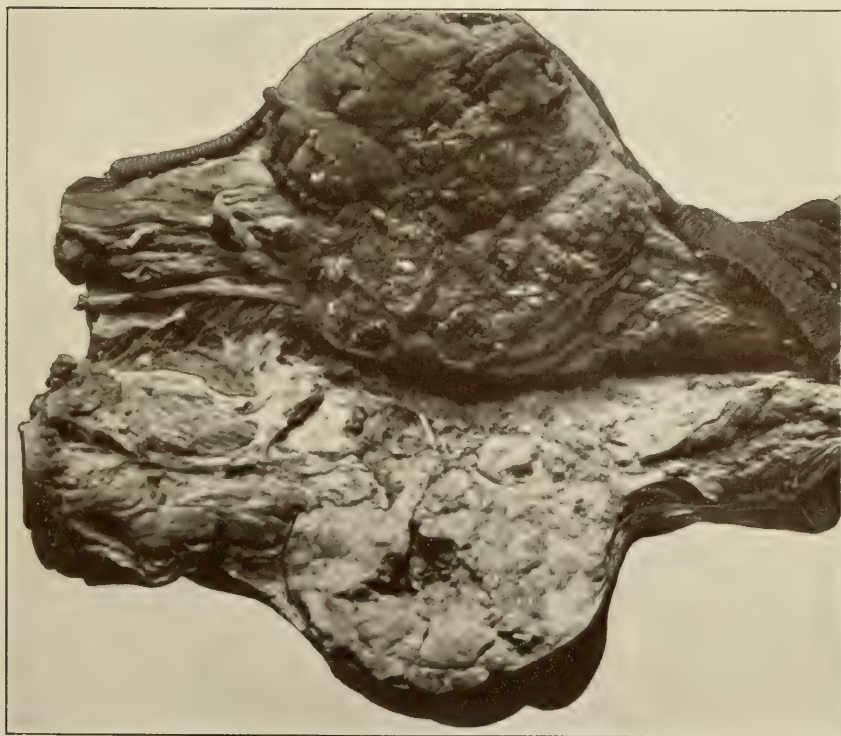
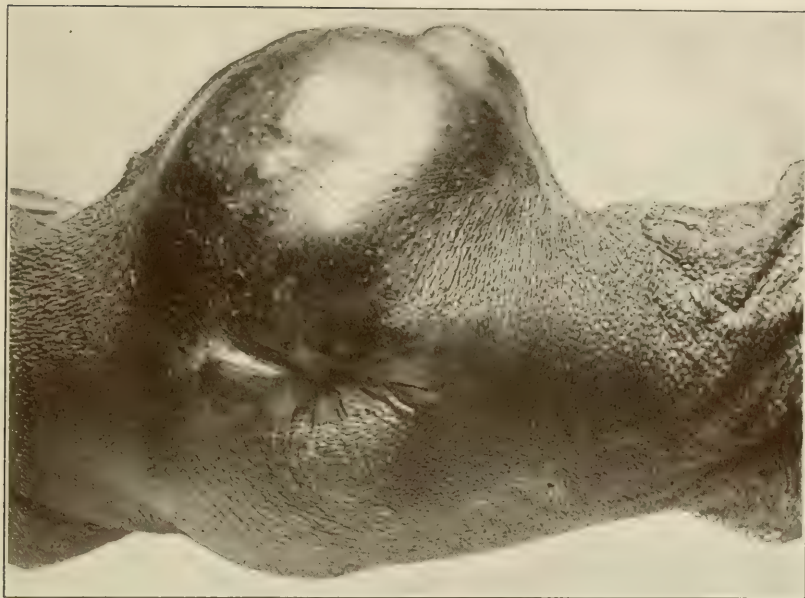
In No. 2 there is a marked lymphocytosis in the synovial membrane with the formation of an inflammatory pannus.

There is nothing new in this report, except the marked changes in

¹ Medical Record, November, 1903.

² Zeitschr. f. orthop. Chir., 1909, xxiii, 307.

³ Centralbl. f. Chir., 1909, xxxvi, Suppl., p. 34.



**Periosteal Spindle- and Round-cell Sarcoma of Lower End
of Femur Involving Knee-joint.**

Colored boy, aged nineteen years. Onset three years six months. First symptoms after trauma, bloody fluid in joint. Slow development of present tumor.

Photograph of specimen after amputation. This represents the type of a bone sarcoma rarely cured even by the highest amputation. See *Progressive Medicine*, December, 1902, page 160, and 1906, page 217. (Patient of Dr. Colton of Baltimore City Hospital.)

the vessels, and the conclusions that they are primary rather than secondary.

MONARTICULAR TRAUMATIC (?) FREE JOINT BODIES. Ernst Ruge's case is remarkable, because the elbow-joint was filled with joint bodies of various sizes which were seen in the *x*-ray, and at the exploration the synovial membrane and articular cartilage showed no disease, except on a small area in the cubital fossa of the humerus about the size of a ten-cent piece there were minute multiple excrescences which differed from the joint bodies only in size. He looked upon this as an area of arthritis deformans, which has given rise to the joint bodies. There is an *x*-ray and a microscopic study.

I have observed a similar case in the shoulder. This patient was a male, aged twenty-six years; coincident with piano practice of five years' duration he had pain in the elbow with limitation of motion, weakness, early fatigue, but no locking, joint crepitation, or recurrent dislocation.

Joint Tumors. In *PROGRESSIVE MEDICINE* for December, 1906 (p. 251), I have discussed the literature up to date, with special consideration of the then most recent contribution of Ruediger and Rydigier.

Hannemueller¹ reports a *primary sarcoma of the joint capsule of the ankle*. As to its location it is so far unique, and it is the second case, so far, in which a clinical diagnosis has been made. In Ruediger's case the diagnosis was also made before operation.

The patient reported by Hannemueller, from Kuettner's clinic in Breslau, was a male, aged forty-four years, a hostler, who seven months before operation, in December, 1908, observed a swelling in the region of the inner malleolus. Perhaps irritated by the trauma of the boot, the swelling ulcerated within three months and was once incised. The patient sought advice chiefly because he was unable to put on his boot. Pain and limping were not prominent symptoms.

Upon examination there was, first, an ulcer about the size of a twenty-five-cent piece which occupies the summit of a swelling covering the inner malleolus, the inner lateral and dorsal surface of the ankle. The swelling is soft and almost semifluctuating. Tenderness is not marked. The *x*-ray shows that the bones are not involved. The tumor throws a faint shadow. None of the tuberculin reactions were employed. The patient refused amputation. A piece was excised for diagnosis and proved to be a *spindle-cell sarcoma*. The local excision was performed bloodlessly under an Esmarch. The tumor was a diffuse growth of spindle-cell tissue between the synovial membrane and the skin, with villi formation from the synovial membrane, but in spite of its diffuse growth there was no invasion or destruction of cartilage, and although it extended down along the tendon sheath it did not involve the tendons.

¹ Beitr. z. klin. Chir., 1909, lxxiii, 307.

Under the microscope the endothelial layer of the synovial membrane is intact. The tumor is composed chiefly of spindle cells and apparently has originated from the synovial membrane. It is quite vascular and the bloodvessels have thick walls.

One would expect such a tumor to destroy the endothelial lining of the synovial membrane, but in a recent case of my own, of huge lymphosarcoma of the mediastinum, the endothelial layer of the pericardium and pleura was intact over the tumor growth.

In discussing the literature, Hannemueller refers to the work of Gilette,¹ in 1875. The other references may be found in PROGRESSIVE MEDICINE, and in Ruediger.

Moser² reports a *giant-cell sarcoma of the capsule of the ankle-joint* which has remained well seven years since operation—a local excision. The patient was a white woman, aged thirty-eight years, and sought advice because of pain in the left foot of two years' duration, although she had observed some swelling which had not given her any concern. There was very little restriction of motion in the ankle-joint. The swelling was between the malleoli in front of the joint and behind the tendons which were freely movable over the tumor. At operation the circumscribed tumor involved the anterior portion of the synovial membrane, but not the tendons. It was completely excised and proved to be a giant-cell sarcoma. The wound healed, and there was a perfect functional result.

This case resembles in my experience a tendon-sheath tumor often containing numerous giant cells, which always remains well after local excision.

Moser, like Hannemueller, was unable to find any primary sarcomas of the synovial membrane of the ankle-joint. He discusses the literature.

Burckhardt's³ case reported from Lexer's clinic is a *fibrosarcoma of the knee-joint*. The patient was a male, aged forty-six years, the tumor of two years' duration following a trauma. The patient sought advice on account of tumor and pain after excessive walking. There was a visible palpable swelling just below and to the outer side of the left patella extending beneath the patellar ligament. Externally, it was nodular, medially smooth, and there was a discreet, smaller nodule near it. The skin was uninvolved. At operation, because the tumor was so close to the patella and its ligament, it was removed with half of the patella, a piece of the ligament, and the joint capsule. But the examination later showed the tumor distinctly encapsulated, and that it could have been dissected from the patella and its ligament. It did not extend to the endothelial layer of the synovial membrane. This tumor, therefore, is like the ordinary fibroma or fibrosarcoma of tendon sheaths. Lexer closed the joint with a plastic operation and obtained

¹ Soc. de Chir. de Paris, February, 1875, x.

² Deutsche. Zeitschr. f. Chir., 1909, xeviii, 306.

³ Ibid., ci, 467.

a beautiful result, but it is my opinion that the tumor could have been removed without this extensive dissection.

M. von Brunn¹ reports the first case of a *primary tumor of the meniscus of the knee-joint*—a *fibroma* of the outer meniscus in a girl, aged eighteen years. The symptom of onset was pain of two years' duration without the history of trauma. The swelling appeared six months later. At the end of the year it was diagnosticated and treated as tubercular arthritis. The swelling was on the outer side of the patella and felt like a hard joint body. The leg was held in flexion and movements were restricted. The skin was not affected. The *x-ray* showed that the femur and tibia in their outer half extending a little beyond the mid-line were separated at least three times the normal, and from this separation there was a shadow extending into the soft parts. The tumor was a somewhat flattened, irregular mass of encapsulated fibrous tissue (Fig. 42) and occupied the position of the external meniscus. It differs from Burekhardt's case in the involvement of the meniscus, but belongs to the same form of tumor.

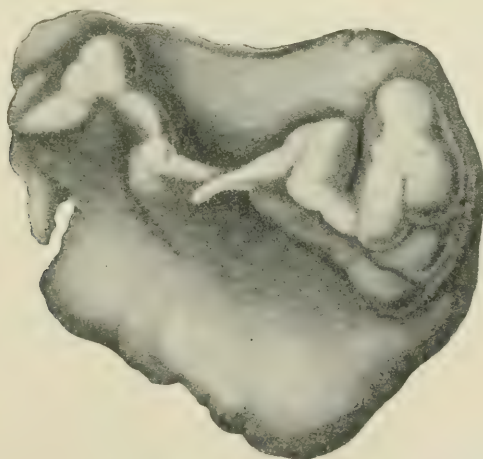


FIG. 42.—Fibroma of outer meniscus. Von Brunn's case.

Lexer,² in reporting the third case of joint chondroma, refers to the two other cases.

Reichel, in 1900, observed a typical chondromatosis of the synovial membrane. There was a chronic villous arthritis, with diffuse cartilage formation, but no changes in the cartilage, the articular surface, or menisci. The patient was a male, aged thirty-six years, and had swelling of the knee for five years. Quite recently there was sudden cracking in the joint with pain and more marked swelling. Upon opening the joint,

¹ Beitr. z. klin. Chir., 1907, lii, 610.

² Deutsche Zeitschr. f. Chir., 1907, lxxxviii, 311.

there was blood and cartilage bodies. The symptoms recurred, and Reichel resected.

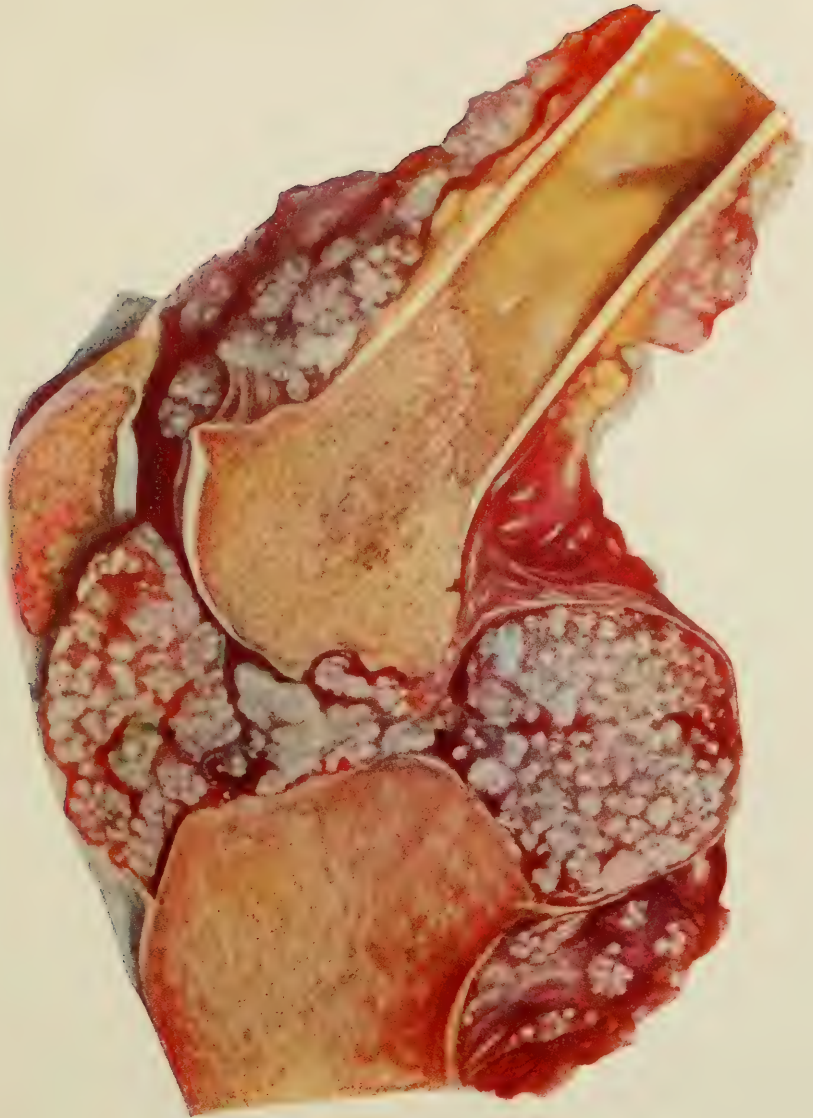
The second case was reported by Riedel, in 1903; a female, aged twenty-two years, had swelling of the wrist near the ulna for five years. She was a very active washerwoman. The swelling was incised by her physician and cartilage bodies were removed. A year later, Riedel operated and found a dilated and thickened capsule covered with cartilage formations. He excised the involved portion of the capsule and these bodies, but did not resect. It recurred in one year, but no further operation was done.



FIG. 43.—Cartilage formation on synovia of knee. (Lexer's case.)

Lexer's case differs from the others chiefly in the extent of the cartilage formation and in that the patient, a male, aged twenty-seven years, had tuberculosis of the lungs, but not of the knee-joint. Six years ago pain was experienced in the right knee without trauma. Within

PLATE V



Joint Chondroma.

(Lexer's case, *Deutsche Zeitschr. f. Chir.*, 1907, vol. lxxxviii, p. 311.)

Male, aged twenty-seven years; symptoms, six years; onset pain; swelling; aspiration of much fluid; pain not relieved. One year after onset tumor masses outside above head of fibula. Six months later stiffening of joint. The patient has tuberculosis of the lungs. On examination small nodular hard tumors; slight flexion in knee; no extension. Crepitation.

X-rays show large cloudy shadows in the region of the capsule.

At operation, on account of infiltration of capsule suspicion of chondrosarcoma, and therefore resection, extracapsular as in tuberculosis.

Microscopically, chondroma with much calcification and ossification.

four months there was so much effusion that it was aspirated without relief of the pain. The effusion did not return. Within one year hard masses were felt about the joint, and within eighteen months there was restricted motion. The examination then revealed hard bodies all about the knee-joint, some slightly movable, others fixed to the bone. There was no effusion. The *x*-ray showed calcified or ossified formations filling the joint, and extending to the popliteal space and a little distance up the femur (Fig. 43). As there was some infiltration of the muscle, Lexer resected and obtained the beautiful specimen shown in Plate V. The cartilage formations show ossification and calcification, and explain the shadow in the *x*-ray. Histologically, there is no malignant transformation, but, as shown in the picture, these cartilage bodies extend up along the femur and in some places have destroyed the articular cartilage extending into the bone.

Lexer, in discussing these cases, interprets them as a diffuse formation of cartilage in synovial membrane and not of the same etiological origin as a single enchondroma which arises from a displaced cartilage germ. For the disease described by him, according to Lexer, excision of the joint must be performed, because only in this way is it possible to remove all of the synovial membrane.

W. Mueller¹ reports a case of diffuse cartilage formation in the metatarsophalangeal joint which Lexer missed in going over the literature. A male, aged twenty-five years, with a history of swelling and impaired function nine months, but no pain. Upon examination there was distinct swelling. Mueller resected. The cartilage formation was confined to the synovial membrane only, the bone was intact. He reproduces two good microscopic sections, refers to Reichel, and states that a third case has been reported in Holland.

SURGERY OF THE BONES

Bone Transplantation. The growing tendency to be conservative in bone sarcoma calls into practice bone transplantation or grafting. It is fortunate that this transplantation is successful, because it will be an additional factor to influence surgeons in the conservative treatment of bone tumors.

In some cases of non-union after fracture, in chronic osteomyelitis and in tuberculosis, better results can be obtained by excision of the diseased bone and its substitution by a graft than by any other method.

The literature on this subject is growing, and we have a very recent communication in American literature which gives the complete bibliography up to date. Henry H. Janeway,² of New York, in reporting

¹ Archiv f. klin. Chir., 1902, lxvi, 637.

² Annals of Surgery, 1910, vol. lii, p. 217.

his case in which a piece of the tibia with its periosteum was transplanted to fill the defect in the ulna, takes the opportunity to give a very good *résumé* of autoplasmic transplantation of bone.

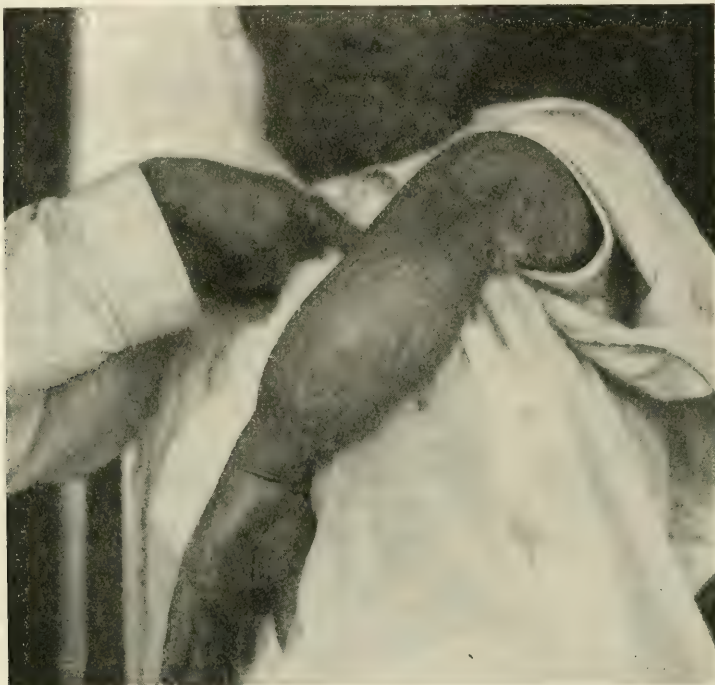


FIG. 44.—Condition of forearm immediately previous to operation.

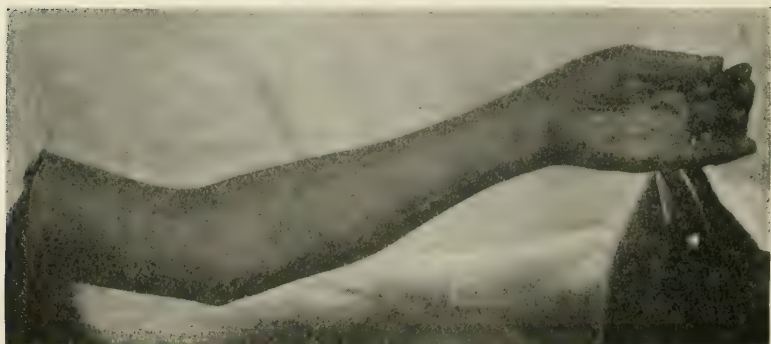


FIG. 45.—Condition after healing of operation wound.

Fig. 44, illustrates the condition of the forearm before the operation, and Fig. 45 the improved appearance after operation. The *x*-ray (Fig. 46) taken one month after operation as compared with Fig. 47 taken fourteen months after operation shows that the periosteal bone

piece from the tibia has distinctly increased in thickness and that at the lower end there is direct bony union, while at the upper end there is callus formation, but not as perfect union.

In this case the ulna was resected to remove a recurrent periosteal tumor, then the tibia was exposed and a piece chiselled off its crest with its adherent periosteum of the same length as the ulnar defect shown

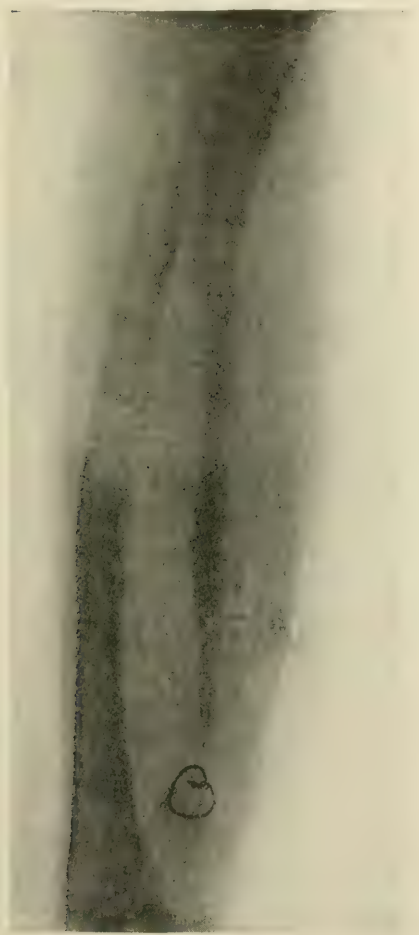


FIG. 46.—Condition of bones one month after operation.

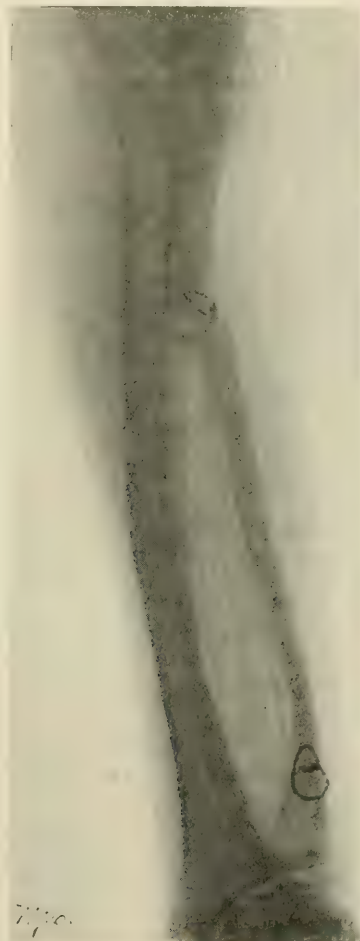


FIG. 47.—Condition of bones fourteen months after operation.

in the x -ray; the fragment was three-fourths of an inch wide and one-eighth of an inch thick. The removal of such a piece, of course, did not weaken the tibia. This periosteal bone fragment was fixed to the ulna with silver wire and its periosteum was sutured to the periosteum of the ulna ends.

We can look upon this as a successful case. There has been a long controversy in regard to the part which heals and lives. Ollier's view, promulgated in 1867, that it was the periosteum which lived and that the bone died and was replaced by vascular granulation tissue from the periosteum, is still held by the majority of authorities.

Interesting as the theoretical considerations are, the importance of the practical side of the question should immediately be understood by the operating surgeons. Bone can be transplanted successfully. Bardenheuer used half an ulna to replace a radius; von Bergmann substituted the fibula into a defect 11 cm. long in the tibia; Klapp removed the entire diaphysis of the humerus and substituted bone and periosteum from the crest of the tibia; Frankenstein substituted the fibula for 25 cm. of the femur, and, as has already been stated, Lexer transplanted entire joints.

When a subperiosteal removal is done, one can transplant bone without its periosteum, for example, if the humerus must be removed subperiosteally, the fibula can be placed in the defect. This bone will act as a splint until the new periosteal bone forms. The fibula within the periosteal humeral cylinder is the best kind of a splint; if the fibula is removed from the leg subperiosteally it will be reformed. When, however, the disease is such that the periosteum must be removed, then in the transplanted bone we must also have periosteum. The tibia is the ideal bone, because we can get a large bone-and-periosteum flap without endangering the continuity of the shaft of the tibia. But in some cases the entire fibula fills the defect better. It does not weaken the leg much to remove the fibula with its periosteum.

I¹ have successfully transplanted a piece of ulna to fill the defect in the lower end of the radius.

Macewen² apparently does not accept Ollier's view. In reporting his cases he writes: "It is to be noted that the periosteum plays no part in the bone reproduction after transplantation, and in the majority of cases referred to, the periosteum was not transplanted along with the bone."

Macewen's observations on bone grafting and reimplantation are of great interest. I do not think he proves the point in regard to periosteum. If the removed bone is taken subperiosteally then the transplanted bone need not have periosteum. Macewen's first case which he has observed thirty years, establishes the fact that the transplanted bone may be in pieces. In this case he filled the periosteal tube after the removal of the humerus with the small pieces of bone removed at the routine operation for bow-legs, knock-knees, and curvatures of the tibia with which his wards were filled at that time.

¹ *Annals of Surgery*, August, 1910, vol. lli, p. 168, Fig. 35.

² *Ibid.*, 1909, vol. l, p. 959.

Preservation of Bone for Transplantation. I mentioned above that Kuettner preserved the hip-joint, removed at autopsy eleven hours after death, for twenty-four hours in salt solution and chloroform before it was implanted. This was done as the result of the experiments of Bauer,¹ of Kuettner's clinic. Over fifty experiments were performed on forty-five dogs. The bone was removed with its periosteum and placed in various solutions—normal salt, concentrated salt, salt solution with chloroform and other bland antiseptics, blood serum, etc. The specimens were preserved in cold storage at a temperature of 0.1° C. They were re-implanted in dogs at varying times of preservation, up to three weeks, and all healed. Microscopic investigation showed organization. That is, the healing in of these preserved pieces of bone is apparently just as perfect as the healing of a fresh, living, autoplasmic piece of bone. If further experience demonstrates the correctness of Bauer's experiments it will simplify, to a certain extent, bone and joint transplantation.

W. Kausch² reports his observations. The most remarkable is the growing in of a periosteum-denuded, boiled piece of tibia. The specimen was obtained nine months later on account of recurrence of the tumor and gave Kausch an opportunity to study the changes microscopically. After resection of 10 cm. of the upper end of the tibia for a medullary sarcoma and the sawing across of the condyles of the femur this piece of bone was substituted. He speaks of it as freshly prepared dead bone. It was dissected from a fresh amputation; the periosteum and the marrow cavity were curetted, it was boiled, soaked in ether and then in alcohol, boiled again. There was a defect of 8 cm. between the femur and tibia, yet the periosteum grew across and produced bone about the transplanted dead bone, and in the meshwork of this dead bone the new tissue also produced bone. The bone itself underwent absorption.

It was different with the ivory pegs which he employed. They underwent absorption, but were not substituted by new bone.

Kausch gives the following methods of bone transplantation in the order of their probable success: (1) Pedunculated soft-part-periosteum-bone flap; (2) freely transplanted, periosteum-covered bone from the patient; (3) freely transplanted, periosteum-covered foreign bone; (4) freshly obtained, boiled bone; (5) freshly obtained, preserved bone; (6) sterile obtained bone from cadaver or fetus; (7) the same, boiled. These methods are for substitution when the bone is removed with its periosteum, that is, into a bed free of periosteum, but there must be accurate approximation of the transplanted bone into the gap—bone to bone.

¹ *Centralbl. f. Chir.*, 1910, xxxvii, No. 31, Supl., p. 20.

² *Beitr. z. klin. Chir.*, 1910, lxxviii, 670.

It is to be noted that in these above seven methods, human bone is employed. Now, when periosteum is not removed, Kausch is of the opinion that we may transplant animal bone, living or sterilized, or substitute even ivory or metal.

Kausch, however, concludes that the problem of bone transplantation and substitution are by no means settled.

I would urge, however, that before sacrificing a limb, bone and joint transplantation be attempted before amputation.

Kausch summarizes his experience as follows:

1. My Case I represents the largest piece of dead bone implanted and permanently healed in a periosteum-less bed.

2. The bone is consolidated and at both ends firmly attached to the original bone.

3. This specimen is the only one of the kind which, owing to an amputation nine months after the implantation, has been studied microscopically. The result of this study is:

- (a) Over the entire circular periosteal defect of 8 cm. new periosteum has formed; evidently the adjacent periosteum has bridged it over.

- (b) The implanted dead bone is in the process of absorption; parallel with this everywhere in the dead bone, new bone has formed.

- (c) This new formation of bone proceeds from the periosteum as well as from the analogous tissue which has proliferated into all available interstitial spaces (endosteum).

- (d) The ivory implanted with the bone is only resorbed; no compensating formation of new bone takes place.

4. It follows that freshly obtained, human, dead bone, contrary to the prevailing views, is a rather useful material for the substitution of bone, even into a bed without periosteum. In the latter case, however, the implanted bone must be in contact with the adjacent bone as well with its periosteum.

5. Bones from cadavers are not suitable for implantation into a periosteumless bed, still less so are foreign bodies.

GENITO-URINARY DISEASES

BY WILLIAM T. BELFIELD, M.D.

Gonorrhea. GONORRHEAL EXOSTOSES OF THE OS CALCIS seem to deserve a larger share of attention than is generally accorded them by genito-urinary surgeons, perhaps because they naturally drift into the hands of orthopedic and general surgeons.

Such exostoses arise from causes other than gonorrhea; indeed, they are found in about 1 per cent. of all males, and in a smaller number of females, many of whom must be exculpated from even a suspicion of gonorrhea. Many of these exostoses cause no pain or other symptom, and are discovered incidentally to the *x*-ray examination of the feet after injury. Hence, it has been assumed that they are mere faulty developments of the bone, the accessory epiphysis failing to unite normally with the body of the os calcis.

Yet various factors indicate that many of these exostoses, including most of those so painful as to require surgical attention, result from local disease rather than from mere malposition; for not only are they surrounded by areas of thickened and infiltrated periosteum, but in various instances they have been found to harbor colonies of gonococci—as yet no other organisms have been identified in them.

As these so-called spurs are usually located upon or project from the inferior surface of the os calcis, they can seldom be identified by the touch, but are revealed by *x*-ray pictures (the foot lying sidewise upon the plate).

Treatment other than removal has heretofore been at best palliative. Even in cases of obvious gonorrheal origin, vaccine and serum treatment has failed to relieve materially. Such failure is, indeed, to be expected, since the destruction of the gonococcus does not induce a recession of the new bone formation. In a case of gonorrheal origin recently treated, vaccine treatment caused amelioration of pain only.

Excision of these exostoses has usually been followed by complete cure, as in two bilateral operations recently reported by Bauman.¹

König² reports 8 cases of “neuralgia of the heel,” in which the exact pathology was determined by operation; in nearly all, the cause of the trouble was an infection of a bursa; in only 2 was a bony spur found. He thinks that not the spur, but an infection or injury of the

¹ Cleveland Medical Journal, May, 1910.

² Deutsche med. Wochenschrift, March 31, 1910.

adjacent bursa is the cause of the pain, and that operation must include curetting and drainage of the bursa as well as removal of the spur.

GONORRHEAL LESIONS OF THE EYE AND SKIN were observed by Heerfordt¹ They are usually rather mild and transient; the skin lesions resembling herpes, and the eye lesions being herpetiform keratitis. They are often accompanied by rheumatoid pains.

GONORRHEAL ARTHRITIS OF WRIST AND KNEE was observed by Lydston² in an infant, aged three weeks, following gonococcus infection of the conjunctivæ two days after birth. The interesting feature of the case, distinguishing it from many others previously reported, was the prompt improvement of the arthritis following the hypodermic injection of antigenococcus serum—the first doses being 3 minims on alternate days, the amount being gradually increased to 15 minims. After four weeks' treatment the joints seemed almost normal.

THE PERSISTENCE OF THE GONOCOCCUS IN THE PROSTATE has been studied by Saxe³ in 150 cases of chronic gonorrhea of from six months to eighteen years' duration. Of these, 31 furnished gonococci in the prostatic secretion, usually with other organisms, of which the staphylococcus was that most frequently found.

EXTENSION OF GONORRHEAL INFECTION. That the automatic muscular contractions normal to the male genital organs favor the extension of gonorrhea to the deeper parts, is maintained by Schindler.⁴ Since atropine suppresses these movements, he administers this drug as a part of the treatment, giving 1, 2, or even 3 mg. daily, subcutaneously or by suppositories. He details cases illustrating the value of this remedy.

Non-gonorrheal Urethritis has been observed by Hume⁵ in thirty individuals, many of whom had, according to their own statements, never cohabited. In all of them the absence of the gonococcus was definitely established, though no other organism was constantly found. The author thinks that in many of his cases the infection of the urethra was an extension from an antecedent balanitis due to the retention of secretions by a long or tight foreskin.

While this may well be a factor in some of these cases, yet it is well known that the normal anterior urethra is inhabited by various pyogenic bacteria; and that the lowering of resistance in the urethral tissues, or the excretion of irritant materials with the urine, may be followed by a non-gonorrheal urethritis.

The successful *treatment* of these infections comprises the removal of the predisposing factor as well as applications to the infected surface.

¹ Journal of the American Medical Association, August 6, 1910.

² Ibid.

³ New York Medical Journal, September 25, 1909.

⁴ Berliner klinische Wochenschrift, September 13, 1909.

⁵ Journal of the American Medical Association, May 21, 1910.

Thus in one of my personal cases, an obstinate non-gonorrheal urethritis promptly ceased when the patient discontinued drinking ginger ale.

It is also to be remembered that the testicle, epididymis, and seminal vesicle are infected by typhoid and tubercle bacilli, and by ordinary pyogenic bacteria in the subjects of blood infection by any of these agents; and it is conceivable that the lower genital canal, the urethra, may be infected from these foci in the upper tract. This has, indeed, been demonstrated for the tubercle bacillus.

THE SURGICAL TREATMENT OF PUS TUBES IN THE MALE is reviewed by Belfield.¹ It is emphasized that while much attention has been given to the diseases of the urinary duct, the less conspicuous seminal duct has been neglected, largely because its infections cause symptoms of "cystitis," with which seminal vesiculitis has often been confused. Even the accessible epididymis has constantly harbored gonorrhea! pus, until recently undetected and undisturbed by surgery.

Attention is called to the anatomy of the seminal duct as an explanation of various familiar clinical phenomena, hitherto unexplained. For example, it is generally known that when gonorrhea extends to the epididymis, the urethral discharge becomes much reduced; but when the epididymitis begins to subside, the urethral discharge reappears. It is also known that just before the epididymis swells, there occurs a period of frequent urination. The explanation is found in the limited distensibility of the seminal vesicle, because of its unyielding fascial envelope. Hence, when the ejaculatory duct becomes occluded by inflammatory swelling, the seminal vesicle cannot expand indefinitely as does the urinary bladder. When the accumulating pus exceeds the limited capacity of ampulla and vesicle, their contractions not only cause vesical irritation and frequent urination, but also force the excess contents through the vas to the epididymis. The front door—the ejaculatory duct—being closed by swelling, the pus is forced out of the back door, the vas deferens.

The urethral discharge is reduced because the purulent contents of the vesicle no longer escape into the urethra; but in a few days, the inflammatory swelling of the ejaculatory duct subsides, the pus again escapes from the vesicle into the urethra, the back pressure on the epididymis ceases, and the epididymitis subsides coincidentally with the reappearance of the urethral discharge.

"Pus infection of the vesicle plus occlusion of the ejaculatory duct, therefore, soon converts the entire seminal duct into a closed abscess. Hence an opening into the vas (vasostomy) affords relief of tension and exit for pus from the entire duct, as well as a means of medicating vas and vesicle by injections."

The clinical importance of the various non-gonorrheal infections of the seminal duct, is enhanced by the knowledge that this duct is

¹ Journal of the American Medical Association, December 25, 1909.

frequently infected from the blood current in patients suffering from bacteriemias, and that these persisting infections may long constitute a source of ill-health to the patient himself and of danger to others. The seminal vesicles seem to harbor not merely gonococci, but also various pyogenic bacteria and organisms of the colon group.

In this connection the observations of Marchildon¹ are noteworthy. In two patients dead of typhoid fever, the Eberth bacilli were found not merely in the secretions but also in the mucous lining of the seminal vesicles and prostate gland. The persistence of these bacilli in various tissues of patients who have recovered from typhoid, suggests as a plausible assumption the probability that these organisms may long persist in the walls of prostate and vesicles; and that they may readily extend thence to the bladder and upper urinary passages. The author suggests that in some of the numerous cases of typhoid bacilluria the primary focus of the urinary infection may be not the kidneys but the vesicles and prostate.

Huet's² article affords further basis for this assumption. He recalls the fact well known to veterinarians, that male animals have transmitted to females bred to them, certain bacterial diseases from which the males had long since recovered. This has been especially noted in the transmission of influenza from stallions to mares, though this disease is not clinically localized in the genital organs.

Huet found that the seminal vesicles of healthy domestic animals often harbor pathogenic bacteria; and that animals dying of experimental infections usually show infected vesicles. More remarkable is his observation that in some animals which had recovered from experimental infection, the pathogenic bacteria were found in the vesicles even when the other organs were sterile.

It would seem then that the seminal vesicles, like the gall-bladder, may long remain the home of pathogenic bacteria even in apparently healthy animals; and that spontaneous, non-gonorrheal urethritis and cystitis may originate in extension of such unsuspected infections. Herein is found an additional reason for irrigation of the vas and vesicle through a vasostomy, as advocated and practised by myself for five years past.

Vesical Tumors. The *surgery of tumors of the bladder* has been, in general, a record of failures to cure. While encouraging reports have been published occasionally, yet the consensus of surgical opinion has been that malignant vesical tumors—and practically all of them seem to be actually or potentially malignant—are virtually beyond permanent relief by surgery, and this, too, although extravescical extensions and metastases are of late occurrence.

¹ American Journal of the Medical Sciences, July, 1910.

² Centralblatt f. Bakteriologie, 1910, p. 477.

The chief reason for this surgical impotence to cure vesical tumors has been the impracticability of applying to their excision the recognized surgical principle of removing all tissues in the immediate vicinity of the neoplasm; for most of these tumors arise in the base of the bladder. They and their vicinage have, therefore, been inaccessible through the extraperitoneal suprapubic and perineal incisions, and their complete removal has been heretofore secured only through total extirpation of the bladder, attended with an almost prohibitive mortality.

Two novel and promising means of attaining success in the eradication of bladder tumors have been reported: The first is the transperitoneal approach to the bladder, which renders this entire organ accessible to the knife and cautery. The feasibility of this avenue to the bladder cavity was first demonstrated, for another purpose, by Harrington in 1893; its availability for the excision of bladder tumors was shown by Mayo in 1908, who removed five vesical neoplasms by this route, and by Scudder and Davis, who followed with four such cases. Employing an improved technique, Judd¹ reports 15 cases of vesical tumor removed by the transperitoneal route with but one death; this patient was a man, aged seventy-one years, one-half of whose bladder was removed, and who died uremic within a week. As this series is unique in the extent of tissue excised, and inaccessibility of the neoplasms as well as in low operative mortality, the following data are quoted from the article of the 14 recoveries from operation.

"Six patients have lived over one year with no evidence of a return of the trouble. All except 2 of these patients (one complaining of frequency and one having a stricture which necessitated secondary operation) have been comfortable and apparently well.

"One patient has been well ten months, one nine months, one five months, and one one month. In this last case nearly one-half of the bladder was removed and the right ureter transplanted into the left half of the bladder. Since one week after operation the patient has passed clear urine. At first he voided very frequently, but the intervals gradually increased, and at the end of one month he averaged one or two times each night.

"One patient with malignant papilloma returned in eighteen months showing a similar tumor in the opposite half of the bladder. This patient was reoperated on, and six months later a cystoscopic examination did not show any evidence of trouble.

"One case of a large malignant papilloma in the left wall above the ureteral opening, ten months later showed no evidence of return in the old site, but there were many small pedunculated tumors growing from the margin of the urethral meatus. These were removed and the bases cauterized. The patient has been free from symptoms for four months. We were unable to trace two of the cases.

¹ *Journal of the American Medical Association*, December 25, 1909.

"The size of these tumors varied from a few centimeters in diameter to a tumor in one instance occupying nearly the entire space of the bladder.

"Four of the 15 patients had more than one tumor. In 9, the pathologist reported malignant papilloma. These included all the cases of multiple growths.

"In 3 of the cases the pathological report was papilloma, probably malignant.

"Three cases were of the straight carcinoma type with indurated base involving the deeper coats and having the open ulcer on the mucous membrane surface.

"Of the 15 cases, in 12 the trouble originated in some point of the base of the bladder, and in the remaining 3 it began in the lateral wall about one-half inch from one ureteral opening. In 3 instances the ureteral orifice itself was involved and it was necessary to transplant the ureter.

"Although we do not advise or believe it necessary to go through the peritoneum in removing tumors in the upper quadrants of the bladder, our experience would lead us to believe that the greater number of neoplasms of this viscus begins in or near the base, and that we can, with very little, if any greater risk to the patient, do a much more technical and radical operation through the peritoneal incision."

The second method is the *passage of high frequency currents* through the substance of the vesical neoplasm. This current—the single pole (Oudin) preferred—is conducted into the growth by means of an insulated cable small enough to be introduced through the ordinary catheterizing cystoscope. The operator guides this cable by visual control, just as the ureter catheter is guided.

The effect of the current seems to be simply cauterization. Repeated contacts or "burnings" are made at each sitting, each contact lasting until the patient complains of pain, usually but a few seconds.

This method has been used by Beer¹ and by Keyes,² who report rapid improvement, even symptomatic cure, in cases of non-malignant vesical tumors, and distinct improvement in several cases of carcinoma. It is understood that these are merely preliminary reports; whether the ultimate results will be better than those of the simple cautery must be determined by further observation.

Leukoplakia of the bladder, involving an area of the vesical wall, 10 cm. long and half as wide, was discovered through the cystoscope by Herzen.³ The patient's symptoms were dysuria and bacteriuria. Through a suprapubic cystotomy the diseased area, mucosa and sub-mucosa, was removed, the bleeding surface cauterized with the Paquelin,

¹ Journal of the American Medical Association, May 16, 1910.

² American Journal of Surgery, July, 1910.

³ Deutsche med. Wochenschrift, July 14, 1910.

and then covered with the healthy mucosa which was kept in place by catgut sutures. A complete cure resulted.

As leukoplakia of the tongue often yields to hypodermic injections of sodium cacodylate, it would seem desirable to try the effect of this remedy before subjecting the patient to a serious operation.

Conditions Simulating Bladder Tumors are discussed by Whiteside;¹ while the cystoscope usually discriminates accurately, yet there are certain conditions which puzzle even an experienced cystoscopist. Prominent among these conditions resembling vesical tumor is the *ulcerated middle lobe of the prostate*; the ragged edges of the ulcer, swaying in the water, and the ready bleeding from its surface, simulate the familiar features of vesical tumor.

The author mentions an interesting and rare personal observation of *syphilitic condylomata in the bladder*, which presented a striking likeness to flat epitheliomata of that organ. Other evidences of syphilis in the patient led to a correct interpretation of the appearances presented by the growths, which, moreover, disappeared under treatment with mercury and iodine. The gradual subsidence of these growths under treatment was observed through the cystoscope.

The possible confusion of *right ureteral calculus* with appendicitis has been repeatedly illustrated in recent literature; a calculus at the brim of the pelvis may cause pain at McBurney's point, temperature and leukocytosis; while appendicitis has been known to be masked by the pronounced urinary symptoms resulting from inclusion of the ureter in the area infected from the appendix. Even the x -ray has confirmed an erroneous diagnosis by revealing the shadow of a concretion in the course of the ureter, which concretion was found upon operation to lie not in the ureter but in the adherent appendix (Seelig, *Annals of Surgery*, 1908, p. 388).

Two additional cases of this character are reported by Brickner;² one, a case of ureter calculus with the usual symptoms and the diagnosis of appendicitis; the other, a case of appendicitis with hematuria. The intimate anatomical relations of the appendix and right ureter, and the consequent errors in diagnosis and operative treatment, are discussed by Brown, Engelbach, and Carman in an illustrated article.³ Many a normal appendix has been unnecessarily removed, and many other lesions in this region simulating appendicitis have been overlooked, because of the prominence given to appendicitis in current medical literature. Urinary calculi induce symptoms simulating appendicitis; the latter causes symptoms, including hematuria, suggesting ureter calculi; even the x -ray has failed to differentiate these two conditions.

¹ Northwest Medicine, November, 1909.

² American Journal of Surgery, July, 1910.

³ Journal of the American Medical Association, May 7, 1910.

The authors' studies on both living and dead subjects lead them to emphasize certain anatomical data; they state that the course of the ureters through the pelvis does not, at least in three cadavers examined correspond to that described in most text-books on anatomy. "Instead of describing a semicircle with the convexity posterior extending from the brim of the pelvis to the symphysis, it was found that in these bodies the ureters lay practically in the same plane from a point just anterior to the base of the sacroiliac synchondrosis to another located at the superior portion of the prostate gland." Hence, "when a sound in the rectum is brought forward beneath the crotch of the symphysis and then passed directly upward for a distance of six inches, the sound traverses the median line of the pelvis in practically the same transverse plane with the ureters, provided their course is as constant as we have found it on three subjects."

The advantage of radiograms of sounds in this position, in distinguishing ureter calculi from the many other bodies which are shadowed by the *x*-ray and which have often been mistaken for concretions in the ureter, is shown in the illustrations.

Several clinical cases are reported as instances of the necessity for using all possible means in differentiating lesions of the appendix and of the right ureter.

Perineau,¹ after performing pyelotomy rather than nephrotomy in 103 cases, strongly advocates this incision, especially for the extraction of calculi. In 15 out of 23 cases of pyelolithotomy he secured primary union. The advantages urged are that pyelotomy does not dislocate the kidney nor injure the renal tissue (which injury may cause bilateral nephritis); there is no hemorrhage, primary or secondary; the ureter can be easily explored with a sound.

Contraindication is furnished by infectious processes requiring evacuation of pus from the kidney substance, or stones which cannot be extracted through the pelvis.

Calculi in the lower ureter are discussed by Pozzi and Proust² in an illustrated article reviewing 91 cases, including 2 personal operations. They present and illustrate various conditions whose *x*-ray pictures closely simulate those made by ureter calculi; among these are phleboliths, paraintestinal concretions, paraureteral exudates, the cheesy centres of lymph glands. The calculi were successfully removed by various routes—through the natural channels, through the bladder, through the kidney, and by direct ureterotomy.

Cabot³ reports with illustrations, two cases of a *calculus in the intrapelvic ureter*. In the first, an oxalate calculus half an inch long, of marked density to the *x*-ray, was not detected by an expert radiographer.

¹ Annales des Maladies des Organes Genito-urinaires, 1910, Nos. 4, 5, and 6

² Revue de Gynecologie, October, 1909.

³ Boston Medical and Surgical Journal, July 21, 1910.

Profiting by this experience, when the x-ray revealed no stone in the second case, an exposure was made obliquely through the pelvis, the patient being bent over a kidney bag. This picture showed a stone an inch long. Both stones lay in front of the sacroiliac joint.

The Changes Produced in the Kidneys by Experimental Ligation of the Ureter are described by Scott.¹ He refers to the general belief, incorporated in most standard text-books, that complete, long-continued or permanent obstruction of the ureter does not cause hydronephrosis, but does cause atrophy of the kidney; and that partial obstruction is the usual cause of hydronephrosis. This dictum seems to have originated with Guyon twenty years ago; but it is directly opposed to several observations that hydronephrosis exists with congenital absence of the corresponding ureter.

In each of twelve dogs one ureter was ligated; in every one marked hydronephrosis of the affected kidney was found at autopsy, one to five weeks later. Scott concludes that contrary to the accepted belief, a sudden, complete, permanent obstruction of the ureter, produces a hydronephrosis of great degree, which develops with great rapidity.

That the Trendelenburg position retards the secretion of urine, seems to be indicated by an observation of Bovée,² who states that during ether anesthesia in 8 cases, and chloroform anesthesia in 8 others, almost no urine was received in the bladder. Hence it would seem that the Trendelenburg position introduces an element of danger in anesthesia of patients presenting renal insufficiency, cardiac or arterial lesions.

The Value of the Bismuth Paste in Closing Persistent Fistulæ following the removal of a tuberculous kidney, has been demonstrated in 10 cases at the Necker hospital in Paris, as related by Berger and Moreno.³ While the results were less rapid and brilliant than have been reported by others, yet healing invariably resulted, even in cases which had been refractory to various other measures. The authors report equally good success in a non-tuberculous renal fistula, following an operation for pyonephrosis due to calculi.

The Surgical Treatment of Dislocated Kidney is reviewed by Harlan.⁴ After tracing the evolution of operative relief, and of the principles involved, he concludes that in the near future all operations intended to "fix" the kidney would become obsolete; that those methods would be practised which replace an obstructed ureter, and support the kidney at its lower pole.

Neoplasms of the Kidney and Ureter are discussed by Squier,⁵ on the basis of 24 cases observed during twelve years in a New York Hospital.

¹ Quarterly Bulletin of the Northwestern University Medical School, June, 1910.

² Journal of the American Medical Association, June 11, 1910.

³ Annales des Maladies des Organes Genito-urinaires, June, 1 1910.

⁴ Journal of the American Medical Association, October 30, 1909.

⁵ Boston Medical and Surgical Journal, October 14, 1909.

The chief lesson taught is that such tumors are seldom recognized until so far advanced that the operative mortality is high, and recurrence frequent. Pain, hematuria, and tumor, the tripod of diagnosis, are usually absent during the earlier stages.

The Relationship between Senile Hypertrophy of the Prostate and Mental Perversions is reaffirmed by Percy.¹ He reports several additional cases in which excessive and unnatural sexual indulgence was associated with senile prostatic hypertrophy, and ceased after the removal of the prostate. For these mental conditions he invents the designation "phrenitis prostatica."

Since the removal of the prostate, hypertrophied or other, has often abolished the capacity for the normal sexual relation, it may well be assumed that this operation may have abolished an abnormal sexual function, as Percy asserts. His deduction that the prostatic hypertrophy caused the sexual perversion is obviously, however, not a logical inference from the premises.

Nervous and Mental Disturbances of the Male Climacteric are discussed by Church.² The demonstration that the male presents a distinct series of phenomena analogous with those designated as the climacteric in women, has not yet been furnished. Yet men, according to the author, present certain psychical disturbances similar to those manifested by women during the menopause; and when tactfully treated, such male patients usually emerge from this period without permanent mental disease.

Treatment by Vaccines was made the subject of special discussion by several of the constituent societies of the Congress of American Physicians and Surgeons, in May, 1910, official reports of which discussions have not yet been published. From personal attendance and communications, the consensus of opinion expressed seems to accord with the summary of the subject given in *PROGRESSIVE MEDICINE* for December, 1909, and with various articles since published.

Therapy with vaccines, especially the autogenous preparations, has been distinctly successful against the staphylococcus and colon bacillus infections, and with the tuberculins. Success with the *staphylococcus vaccines* has been recorded not merely against local infections, such as boils, but also against the severest manifestations, including blood infections. Thus, Deaver and Da Costa stated before the Surgical Association that they had treated staphylococcus septicemia in all stages with most prompt and favorable results.

Colon bacillus infections, especially of the urinary tract, have been eradicated with equally gratifying success. Thus, at the same meeting, Finney and Mayo reported each a case of refractory colon bacillus

¹ Journal of the American Medical Association, July 2, 1910.

² Ibid., July 23, 1910.

infection of bladder and kidney, which had yielded promptly to the appropriate vaccine; and McArthur mentioned several cases of essential renal hematuria that had been cured by colon vaccines (two cases of this sort cured by colon vaccines, in one after nephrotomy had failed, reported by Billings, were mentioned in *PROGRESSIVE MEDICINE*, December, 1909).

The great value of the *tuberculin* is already generally recognized. Rixford mentioned a patient suffering from tuberculous anal fistula, and tuberculosis of the wrist and spinal column, who was completely restored to health two years earlier, gained forty pounds in weight, and remains well, as a result of treatment with tuberculin. De Forest and Thomas treat tuberculosis of bones and joints when complicated with pyogenic infections, such as spinal caries and hip-joint disease, with alternate injections of tuberculin, and of the appropriate vaccine of the pyogenic bacterium present in a given case. They consider this mixed treatment a valuable aid to surgical and orthopedic procedures.

Hartwell, Streeter and Green¹ report their observations upon the treatment of 97 cases of promiscuous septic infections, including 18 puerperal cases, and 22 laparotomy wounds. After a detailed account they conclude that bacterial vaccines should be employed in puerperal infections, and in septic infections which have remained stationary for some time; but that they often fail to produce marked improvement.

To the general approval of the tuberculin treatment of genital and urinary tuberculosis, Wildbolz² offers objection at least in the matter of kidney tuberculosis. He admits that the general health of such patients is improved by treatment with tuberculin, and that long remissions in the course of the disease may occur—though he has seen such remissions when no tuberculin has been used. Yet microscopic examination of the kidneys in 5 cases, after prolonged courses of tuberculin treatment, failed to reveal any tendency to healing of the tuberculous processes. In 4 of these cases the disease was unilateral, and the opportunity for healing correspondingly good.

He concludes that in cases of early and limited tuberculosis of one kidney, a trial of the tuberculin treatment is justified; but that constant supervision should be maintained, and the period for a successful nephrectomy not allowed to pass.

After considerable experience with the tuberculin treatment of tuberculosis in the male genitals and in the urinary organs, extending over five years, I am thoroughly convinced of its extreme value, even in the advanced stages of the disease that usually come to the genito-urinary surgeon. It is also apparent that this infection when located in the

¹ Surgery, Gynecology, and Obstetrics, September, 1909.

² Berliner klin. Wochenschrift, June 27, 1910.

kidney is less amenable to tuberculin treatment than when found in the genital and lower urinary tract.

In the cases in which the diagnosis is made, and tuberculin treatment appropriately applied before the stage of extensive involvement is reached, healing is the rule, failure the exception. It has also been impressed upon me that the infection is commonly overlooked in the earlier stages of genital tuberculosis.

Rovsing stated before the International Medical Congress, 1909, that he had treated in twelve years 285 cases of *infection of the urinary tract by the Bacillus coli*. In 180 individuals who had never been catheterized, infection began in the kidney or pelvis, frequently with febrile symptoms and hematuria. Primary infection of the bladder is rare, since the epithelium of this organ is highly immune to this bacillus. The nephritis was usually hematogenous, the points of entrance to the circulation being infections of the tonsils, gall-bladder, appendix, and intestine.

Operative interference is not usually required unless for the removal of calculi or other antecedent lesion. Flushing of the kidneys by having the patient drink three or four quarts of water daily, and taking salol, usually suffices. When the bladder is infected it should be injected with silver nitrate solution. He has not seen benefit result from washing the renal pelvis through the ureter catheter, and does not discuss treatment by vaccines.

Boari's Operation. Boari¹ developed experimentally on dogs, and then performed upon a man, an operation whereby the vasa deferentia are transplanted so as to empty into the urethra. The vasa are exposed through an incision high up on the scrotal raphe, and the peripheral stumps are sutured together like the barrels of a shot-gun. Through a transverse incision in the anterior urethra these stumps are introduced and sutured. In the human as well as in canine subjects, the seminal fluid was discharged into the urethra.

While the field of this ingenious operation seems to be small, yet in special cases it may well be valuable. Most of the obstructions to the passage of spermatozoa occur in the tail of the epididymis or in the easily accessible parts of the vas deferens; these may be remedied by anastomosing the head of the epididymis with the vas, when the obstruction is in the tail, and by resecting the vas when the obstruction is in this duct. Boari's operation would be useful in cases of obstruction to the intrapelvic vas, the ampulla, or the ejaculatory duct.

Retention of the Testis. That one of the causes of retention of the testis is appendicitis in the fetus, is maintained by Cantwell² on the basis of 4 observed cases. In 3 of these the retained testis was found just beneath the appendix. He argues that the right testicle is retained

¹ Policlinico, September 19, 1909.

² American Journal of Surgery, October, 1909.

more often than the left, that slight adhesions may well prevent descent of the organ, and that adhesions are frequently found in the peritoneum of the fetus.

Experimental Infection of the Parotid Gland, and occasionally of the testis, was induced in dogs and monkeys by Herl,¹ by the injection into Steno's duct of a diplococcus isolated from a case of mumps. The cultural characteristics of this organism correspond with those of the diplococcus isolated from cases of mumps by Laveran and Catrin.

The Relations of Various Ductless Glands to Diseases of the Urinary and Genital Organs is acquiring much clinical interest. While our knowledge of their physiology is by no means complete, and of their pathology still less satisfying, yet many isolated observations are accumulating upon which attempts at rational diagnosis and therapy may be based.

The ductless glands may be divided into two classes in their relation to genito-urinary diseases: (1) Those which influence these organs by affecting the entire organism—such as the thyroid and pancreas; and (2) the glands which seem to be intimately associated with the genital and urinary organs, such as the adrenal cortex and the pituitary gland (hypophysis). It is well known that deficient thyroid function is responsible for cretinism and myxedema, in each of which conditions the genital organs and function are in abeyance; and that through thyroid feeding the general development, as well as that of the genital organs, is materially furthered. The same series of phenomena have been associated with lack of pancreas function, and have been remedied by pancreas feeding.

The glands which seem to have more direct and limited association with the genital and urinary organs, are the pineal, pituitary, thymus, and adrenal (cortex). *Tumors of the pineal gland* and of the *adrenal cortex* have been repeatedly found associated with precocious development of the sexual organs and characteristics. On the other hand, the *persistent thymus* is usually associated with infantile genitalia; and *tumors of the pituitary gland* are sometimes accompanied with loss of function, and even structural atrophy, of the testes and ovaries. The removal of the large thymus on the one hand, or of certain hypophyseal tumors on the other, has in several instances been followed by a normal development of the sex organs and functions.

Hypophysis tumors, moreover, have been repeatedly associated with marked polyuria (without sugar) which has disappeared upon the removal of a part or the whole of the hypophysis enlargement.

A mystifying element consists in the observation that the same phenomena—polyuria and genital atrophy—have been associated with different tumors of the hypophysis from which opposite effects could be expected. Thus, a cyst of the hypophysis, presumably causing

¹ Archives of Internal Medicine, September, 1909.

destruction of the gland and decreased function, seems to have the same effects as adenoma of the gland, presumably causing increased secretion. And the surgical removal of cyst or adenoma seems equally successful in restoring the normal function of kidneys and testes. It is, of course, possible that the increased pressure in an adenoma of the hypophysis, due to its bony casing, may interfere with its function and thus have the same effect—hyposecretion—as destruction of the gland by a cyst. These are problems still unsolved.

Moreover, several of these ductless glands comprise two distinct parts, which in their origin and function are quite diverse and independent. Thus, the suprarenal gland consists of *medulla* and *cortex*; the former derived from nerve elements, the cortex, on the other hand, arising in a different locality in the embryo, and having a tubular secreting structure which suggests origin in a primitive kidney. Only after it is completely formed does the cortex change its location to the region above the permanent kidney, and there become amalgamated with the medulla to form the composite organ called the suprarenal or adrenal gland. Moreover, the vasoconstricting substance, which has come into familiar clinical use under the name “adrenalin,” is derived from the medulla only; the cortex of the adrenal does not furnish adrenalin. On the other hand, precocious sexual development is a result of overactivity of the cortex only; hyperplasia of the medulla does not seem to excite sexual development.

Similarly, the hypophysis is developed from two distinct parts: (1) The *nervous element*, corresponding to the suprarenal medulla, which, like the latter, furnishes a powerful vasoconstrictor substance, “*pituitrin*,” and (2) *an anterior lobe*, derived from a pharyngeal gland in the embryo, which, like the suprarenal cortex, does not furnish a vasoconstrictor substance. In most of the operated cases, the part diseased has not been fully identified.

The clinical recognitions of lesions of the adrenal (aside from Addison's disease) have been few; most of our knowledge of morbid states due to other diseases of the adrenal has been acquired at the post-mortem table.

Disease of the hypophysis, aside from acromegaly, has seldom been recognized until pressure of the enlarging organ has caused persistent headache and pronounced eye symptoms, especially bitemporal hemianopsia. Therapy has been limited to the surgical removal of the accessible parts of the gland, sometimes the anterior lobe, sometimes the infundibulum or whatever was most accessible.

Clinically, therefore, we stand merely at the gateway of what appears to be an immense field of observation, whose exploration offers promise of valuable additions to our therapy. At present we can merely collate isolated observations, which do not as yet warrant generalized deductions.

The association of pineal gland tumors with precocious sexuality is discussed by Raymond and Claude.¹ They collect five cases from the literature and add one observation of their own. These subjects were all under ten years of age, but showed sexual organs, pubic and face hair as usually seen after puberty. One boy, aged five and one-half years (Hochwart's case), exhibited also erections and a deep voice. The pineal lesions found on autopsy of these cases are described as teratoma in 2 patients, sarcoma in 2, glioma in 2. Other ductless glands seemed normal except in one case, associated with marked adiposity, in which the suprarenals were found much hypertrophied. In this case the pineal tumor was 4 cm. in diameter.

Although some 30 other cases of pineal tumors have come to autopsy in adult subjects, no sexual abnormalities are recorded in them. It is only in young subjects, mostly under ten years of age, that such tumors are known to be associated with sexual features. It is also asserted that the physiological activity of the pineal gland ceases before puberty, after which time its structure degenerates and its tissue is replaced by mineral concretions.

Since hydrocephalus, at least of the ventricles, usually accompanies these tumors, it is possible that pressure atrophy of parts of the brain may be a contributing factor in these results.

The association of the adrenals with the sexual organs was brought prominently forward by Bulloch and Sequeira,² who tabulated 17 cases (one personal) of sexual precocity associated with hypertrophy, 5 of malignant disease, 12 of the adrenal cortex. They also recorded 4 cases of retarded sexual characters associated with arrest or atrophy of the adrenals. Of the 12 subjects of sexual precocity and adrenal malignancy, 10 were under seven years of age. Several were curiosities—a girl, aged four years, had pubic hair, and a beard that required regular shaving; a boy, aged five and one-half years, appeared to be about sixteen, in size and sexual development. These authors also tabulated 13 cases of sarcoma of the medullary portion of the adrenal *without* sexual precocity.

Since the publication of this article there have appeared various reports of a condition called "pseudohermaphroditism," of which Thunim's case is a typical example.³ In a girl of normally feminine sexuality, menstruation became irregular and stopped at sixteen. Luxuriant hair appeared on face, breast, and linea alba; the voice was lowered to the masculine pitch. At seventeen death occurred from erysipelas. The autopsy showed a normal female except that the left adrenal cortex was enlarged to the size of a fist. The ovaries were small and hard. The thyroid was very large, but the hypophysis was normal.

¹ Bulletin de l'Académie de Médecine, 1910, No. 10.

² Transactions of the Pathological Society of London, 1905, vol. lvi.

³ Berliner klin. Wochenschrift, January 18, 1909.

The premature or excessive growth of face and body hair is a common feature of overgrowth of the adrenal cortex. Neugebauer collected 13 such cases. Enlargement of the adrenal medulla is not regularly accompanied with such hirsuties. In fact, the growth of a beard in female children affords a strong presumption of hypernephroma, and the "bearded woman" of the museum is a pathological reality. Thus Thornton observed a woman, aged thirty-six years, whose beard compelled frequent shaving, and whose body was covered throughout with black silky hair. After the removal of a large abdominal tumor which proved to be the left adrenal, the body hair and beard disappeared.

Guthrie and Emery¹ distinguished two types of precocity associated with tumors of the ductless glands; in one there occurs premature development of the sexual organs and remarkable muscular strength; in the second type there is no sexual precocity except in pubic hair, but there is seen a remarkable obesity. They report 11 cases of the muscular type with precocious development of the genital organs; in 2 of these there was found postmortem enlargement of the adrenal cortex; in 2, a pineal tumor; in 1, epithelioma of the testis. In the other cases no autopsy was performed.

These authors also report 10 cases of precocious hirsuties with obesity, with 9 autopsies; in 8 of these there was found postmortem a hydro-nephroma; in 1, no tumor of any kind was discovered.

The opposite condition—shrivelling of the adrenals—was found postmortem in a remarkable case reported by Gifford.² This boy's history was traced from his fourth year to his death at seventeen. He was hairless everywhere except for the presence of a few white hairs, giving the appearance of advanced age. The testes were no larger than is usual in boys, aged ten to twelve years, though he is said to have had seminal emissions during the last year of his life. There were no mammary glands. At autopsy the suprarenals were found very small and fibrous; the hypophysis seemed normal though not critically examined. The thymus was large but fibrous.

Bulloch and Sequeira³ report the case of a woman who came to autopsy when thirty-nine years old. She had borne two children, before menstruation ceased at twenty-seven. At autopsy the genitals and axillæ were practically hairless; the internal genital organs were small, the ovaries atrophic. Both suprarenals were so atrophied that it was difficult to distinguish them from the surrounding fat.

Our present knowledge indicates that precocity in the development of the sexual organs and secondary sexual characteristics, notably face and body hair, proceeds from tumor or hyperplasia of the sex glands (testes or ovaries), of the pineal gland, or of the adrenal cortex;

¹ Transactions of the London Clinical Society, vol. xl, p. 175.

² London Practitioner, vol. lxxiii, p. 188.

³ Loc. cit.

and conversely, that atrophy of the testes or ovaries, and disappearance of the secondary sexual features, notably face and body hair (but *not* scalp hair) may proceed from defective secretion by the suprarenal cortex.

Therapeutic application of these data seems to have been made by Love¹ in the case of a woman, aged fifty-two years, presenting a cold, hard, dark skin, with painful, stiff, and ulcerated joints. The administration of desiccated adrenal tissue was followed by immediate improvement which continued about a year. She then refused to take the remedy longer, complaining that it hurt her stomach. The former symptoms returned, with fatal termination.

At the autopsy, all the internal organs, including the hypophysis, were found normal, except that no trace of the adrenals was discovered.

Several cases, one of which I have briefly reported,² exemplify a clinical type seemingly hitherto unrecognized, which I have termed "retrograde puberty," and which seems to be essentially a lack of secretion by the suprarenal cortex. Three cases have come under my personal observation, and two have been reported to me by others. The distinctive features are (1) more or less complete loss of the hair developed with puberty, *i. e.*, beard, pubic, axillary, and general body hair, without impairment of the scalp hair; (2) more or less marked atrophy of the testes, with corresponding impairment of the capacity for copulation. In two of the five cases known to me, there has been marked polyuria without sugar, which symptom has led to the diagnosis "diabetes insipidus."

The loss of beard and body hair and atrophy of the testes, without other abnormality, reproduces the status of the boy before puberty. Hence I have designated this morbid process "retrograde puberty."

In the case already reported, this retrograde puberty began in a healthy married man, aged twenty-seven years, and had persisted twelve years when he consulted me. The polyuria, three to five quarts daily, suggested the possibility of a hypophysis tumor; but the *x*-ray revealed a normal sella turcica. After experimenting with thyroid substance, adrenalin (which is derived from the adrenal medulla only) and pituitary substance without appreciable benefit, I prescribed suprarenal substance (containing cortex, as well as medulla). After four months' treatment with this (four to six grains daily) the atrophied testes had doubled in size, copulation had been repeatedly practised (the first time in twelve years), the daily urine was reduced to less than three quarts, and there was a distinct growth of beard and body hair. This improvement is still maintained. In none of the other cases have I as yet had the opportunity to observe the effects of long-continued ingestion of suprarenal tissue.

¹ New York Medical Journal, January 29, 1910.

² Journal of the American Medical Association, July 16, 1910.

Because the intravenous injection of adrenalin in rabbits has experimentally produced atheroma of the aorta and smaller arteries, fear of a similar result from prolonged injection of the gland substance has been expressed. That such fears are groundless is shown by many cases, notably that of Hall.¹ This patient, a physician, took hypodermically from 200 to 300 minims of a 1 to 1000 solution of adrenalin daily for five and one-half years (for the relief of asthma); at the end of this period, careful examination determined a normal condition of heart, arteries, kidneys, and blood pressure.

The therapy of genital and urinary diseases through the hypophysis is as yet limited to the surgical removal of pituitary tumors. These operations have hitherto been performed only on cases presenting marked eye lesions and severe headaches. In most of the reports but little is said as to the existence of genito-urinary disturbances before, or the disappearance thereof after the operation. Eiselsberg² removed part of a hypophysis tumor in an undeveloped male, aged twenty-two years, who had no pubic hair nor erections, but presented infantile adiposity. Within a year pubic hair and erections appeared. Halstead's case,³ a married man, had become impotent (had severe headaches and eye symptoms), but regained sexual power after the removal of a portion of a hypophysis adenoma. In several other cases infantile adiposity and genital impairment (amenorrhea) have been relieved by the removal of cysts or hyperplasias of the pituitary. These three elements—adiposity, genital atrophy, and hypophysis disease, often called Frölich's syndrome—are generally considered a clinical entity; yet the elaborate and extensive experiments of Cushing⁴ indicate that adiposity and genital atrophy may fail to appear after mutilation of the hypophysis in any part or degree.

Our present knowledge permits the tentative assumption that a tumor, cystic or solid, of the anterior portion of the hypophysis is associated with acromegaly, while a tumor of the infundibulum is associated with genital atrophy and adiposity; that neither of these tumors, or resulting marked conditions has yet been relieved by other than surgical means, and that genital atrophy, with or without adiposity, occurs independently of hypophysis disease.⁵

¹ Journal of the American Medical Association, July 9, 1910.

² Wiener klin. Wochenschrift, 1909, No. 8.

³ Surgery, Gynecology, and Obstetrics, May, 1910.

⁴ Johns Hopkins Hospital Bulletin, May, 1910.

⁵ An unpublished observation of my own constitutes, I believe, the first exception to this statement. A lady, aged sixty years, referred by Dr. W. A. Wickham, of South Bend, Indiana, had for two years suffered from marked "diabetes insipidus," the polyuria and polydipsia being extreme. Investigation revealed that as the polyuria developed, the body and scalp hair disappeared until but little remained; and that distinct adiposity had occurred coincidently. As the menopause had occurred fifteen years earlier, possible changes in the sex organs could

To summarize: It is evident that the ductless glands, developed in the early history of animal life (as shown by their early appearance in the human embryo) furnish diverse forces whose resultant is the building of (1) the individual, and (2) his offspring—soma and sperm. While we do not yet know the individual forces whose delicate balance results in normal growth first of the body and later of the reproductive organs, yet we see that deviations from normal development find constant expression in abnormalities of one or another ductless gland. The thymus, for example, relatively large in infancy, becomes distinctly less prominent when the testes develop their spermatogenic function—from fifteen years onward—and becomes fibrous in the third decade of life. The removal of the testes before puberty prolongs the activity of the thymus, and a persistent thymus is always found to be associated with infantile testes. Early castration tends to excessive bone-growth (gigantism) and enlargement of the hypophysis; while giants usually present undeveloped testes, large hypophyses and polyuria.

The suprarenal cortex, on the other hand, seems to further the spermatogenic rather than the somatic growth; hyperplasia of these glands goes hand in hand with precocious sexuality, atrophy of the suprarenal with atrophy of the testes. In short, every pronounced abnormality of any ductless gland seems to be associated—either as cause or effect—with distinct abnormality of the sexual glands (testes or ovaries), and with changes in the secondary sexual features, such as body and face hair. With increasing knowledge, we may expect to find in the sexual organs and characteristics, diagnostic aids in recognizing lesions of the various ductless glands; and in thus analyzing the correlation and interdependence among these glands, as yet unsolved.

not be demonstrated. A diagnosis of hyposecretion by the pituitary infundibulum was made; and pituitary gland substance—nine grains daily—was prescribed; the entire gland being used because the infundibular substance alone could not be obtained. Within ten days the painful dryness of the mouth had ceased, the excreted urine and the thirst had markedly diminished. This improvement is maintained.

PRACTICAL THERAPEUTIC REFERENDUM.

By H. R. M. LANDIS, M.D.

Acetone. Of all the remedial agents used in the treatment of *inoperable carcinoma*, acetone has probably given the best results. The chief aim in these cases is to reduce the weakening hemorrhages, lessen the septic absorption, and to check the intolerable odor of the discharge. With these points in mind Gellhorn¹ was led to try acetone in those cases that had passed beyond hope of relief from surgical procedures. Several observers have verified Gellhorn's results.

Tovey² records his experiences in the use of acetone in fifteen cases of inoperable carcinoma with very satisfactory results. He describes acetone as a transparent, colorless, mobile, and volatile liquid of a characteristic ethereal odor and a pungent sweetish taste. On the skin it causes a sensation of cold. It is used in the laboratory for hardening tissues; in it the tissues shrink so rapidly, owing to its hygroscopic qualities, that if left in the fluid for more than half an hour they become too hard for the microtome knife. It is this hardening property of acetone which led Gellhorn to use it. He found the ulcerating surface could be hardened "in vivo," the discharge being checked until the escharotic portion would be cast off. The resulting free surface could then again be hardened, and occasionally it was possible to harden deeper portions, or even the entire tumor, thus rendering the growth temporarily harmless.

The acetone treatment is indicated in any inoperable case of carcinoma of the uterine cervix, or of the surface of the body in which the breaking down area can be submitted to its action. The ulcerating area should be scraped out under anesthesia. The curetted cavity, or crater, is then carefully dried with gauze sponges and one-half to one ounce of acetone is poured through a Ferguson or other tubular speculum and allowed to bathe this denuded surface. The patient is raised in the Trendelenburg position, thereby facilitating the retention of the fluid. The anesthesia is then interrupted and the patient is left in the elevated position for from fifteen to thirty minutes. By lowering the pelvis the acetone is permitted to flow out through the speculum, and the cavity is then packed with gauze saturated with acetone. The healthy mucosa of the vagina and vulva are then washed off with

¹ Journal of the American Medical Association, April 22, 1907.

² Medical Record, November 6, 1909.

sterile water and the vagina packed with dry gauze to protect it from the action of the acetone. After the preliminary curettage, the regular treatment requires no further hospital care, and is administered twice or three times a week without narcosis, beginning the fifth day after the operation, and may be given with the patient in bed or on the examining chair in the office. The vulvar mucosa and outer skin should be protected by a coating of vaseline to prevent the intense burning sensation and whitish discoloration which is produced by the acetone when coming in contact with these parts but which can be immediately relieved by the application of cold water if it should happen to do so.

The immediate effect of this simple procedure is to check the weakening hemorrhages. The surface of the crater becomes covered with a white film. There is a marked reduction in the intense odor, and the discharge becomes watery and then entirely disappears. After two or three weeks of treatment a considerable diminution in the extent of the wound is noticeable. The walls of the cavity become smooth and firm so that the finger cannot remove any friable tissue. The general condition of the patient improves rapidly with the disappearance of the intolerable odor of the discharge, the exhausting hemorrhages, and diminished absorption of the toxins of the necrotic tissue. The sensations of pain caused by the extension of the cancer to nerve trunks and adjoining organs beyond the reach of the acetone, require anodynes for their relief as before. Gellhorn¹ advocates the use of *acetone bisulphate in cancer of the lower vagina and vulva*, since acetone is too painful in these conditions. He claims the action is only slightly inferior to acetone itself.

Adrenalin. Adrenalin therapy has been reviewed by me in *PROGRESSIVE MEDICINE* for 1909. During the past year many important papers have appeared on this subject, and the field for the application of this most potent remedy has been materially increased.

Thornton² has used adrenalin chloride in *plague*. Its use was suggested by Dr. Anderson as the result of a number of postmortem examinations, at which he had been struck by the extreme congestion of the organs of the bodies examined, which is so typical of plague. He thought that if a vasoconstricting drug were exhibited this general congestion might be prevented, with much advantage to the patient. Adrenalin chloride naturally suggested itself to him, as, besides constricting the peripheral bloodvessels, it is also a powerful cardiac stimulant. The pathological changes found in the suprarenal glands themselves in fatal cases of plague were remembered, and it was thought that these changes might perhaps alter the normal action of the glands for the time being. In plague these glands are invariably found enlarged and extremely congested, if not actually hemorrhagic. It is well known

¹ *Journal of Obstetrics*, May, 1909.

² *Lancet*, April 9, 1910.

that the removal of the suprarenals in monkeys is always fatal, death usually taking place within a period of twenty-four hours after operation. Almost immediately after operation the blood pressure falls, the animal becomes lazy, feeble, and lethargic, and dies from heart failure. In plague, it is also essentially the circulatory system that is almost at once profoundly affected by the disease, and it was suggested that this might be due in some measure to pathological changes occurring in the suprarenals. On the administration of the drug in the first few cases in which it was tried, the results were sufficiently satisfactory to insure that all future cases admitted during an outbreak of plague should be treated in the same manner.

The East London outbreak, which occurred in March, 1905, came to an end before a definite opinion, based on statistical data of any value, could be expressed as to the treatment; but in 1907, during an outbreak at King Williamstown, the author was afforded an opportunity of treating a further series of cases with adrenalin, bringing the total number of consecutive cases treated by this method up to 50. For adults, 30 minim doses of adrenal in chloride of a strength of 1 to 1000 were at first usually given by the mouth, with 10 minims of the tincture of strophanthus every four hours for the first three days, and three times a day thereafter for approximately another fourteen days. Later, especially if the patient was extremely ill on admission, it was usual for the adrenalin to be given hypodermically or intravenously, in somewhat smaller doses until the patient was out of danger, when it was given, as in the earlier cases, by the mouth. The mixture for oral administration was made up as required, for it does not keep.

In the worst bubonic cases it was usual to commence the treatment by injecting 20 minims of the adrenalin chloride solution in the neighborhood of the buboes, especially where the buboes were unusually painful or where much extravasation was occurring into the surrounding tissues. The axillary cases particularly (where there are usually extensive serous effusion and hemorrhagic extravasation involving the axillary areas and ribs) appeared to benefit from the injections into the neighborhood of the bubo, and in these cases much of the usual extravasation was prevented. The hospital mortality from plague (excluding septicemic cases), in those patients not treated with adrenalin, has been 37.4 per cent., or, excluding Asiatics, 35.9 per cent., as compared with a mortality of 26 per cent. among those treated with adrenalin. The lower mortality does not appear to have been due to the fact that the patients treated with adrenalin had the disease in an unusually mild form, for if anything, they appeared generally to have been somewhat worse than the patients who usually come under treatment, especially those toward the middle and end of the series.

In all fatal cases in which adrenalin chloride had been used, the

alterations in the postmortem appearances were extremely marked, although they were only what could be expected after the use of a drug possessing vasoconstricting properties in such a degree. In nearly all the cases in which the drug had been freely used there was a marked diminution in the usual congestion of the organs; no hemorrhages or petechiæ, less suffusion into the pleura and pericardium, less enlargement of the spleen and liver, and very little enlargement or alteration in the appearances of the suprarenal glands. In smears made for microscopic examination from such fatal cases which had been treated to any extent by the drug, plague bacilli were found to be present in far fewer numbers than is ordinarily the case. Indeed, plague bacilli could not be found microscopically at all in smears made during the postmortem examinations from certain of these cases, and more especially the pneumonic cases, although inoculated animals died from plague.

Rebaudi,¹ of Bossi's clinic at Genoa, after referring to the good results obtained by several observers from the use of adrenalin by local application to the nasal mucous membrane in the treatment of *vomiting during pregnancy*, narrates a case in which a primipara suffered from general indisposition, asthenia, melancholy, and depression. The patient had many symptoms of toxemia, headache, vasomotor disturbance, loss of appetite, impaired digestion, and excessive secretion of saliva. Pernicious nausea developed later. Various methods of treatment were unsuccessful, and the interruption of pregnancy was seriously considered. Nutrient enemas and drugs per rectum were all of no avail. Before resorting to the operation the patient was fed by rectal injections, and 20 drops of 1 to 1000 adrenalin solution were given daily, 10 drops in the morning and 10 in the evening. During the first three days, the patient also received by rectum a small quantity of water containing 20 drops of laudanum, and after that small doses of ice water. In about two days after beginning this treatment, the vomiting, which had been practically continuous, ceased, and on the third day the patient took small quantities of cold food. The symptoms had so largely disappeared by the sixth day that the patient felt comfortable. On the eleventh day the dose of adrenalin was reduced to 10 drops, and this was continued for nine days. The patient's condition became practically normal, she was able to take nourishment and gained in weight. Later the patient had a recurrence of the nausea and other symptoms, which ceased after five administrations of 10 drops of the solution daily. The adrenalin, Rebaudi says, did not seem to have any injurious by-effects either on the mother or fetus.

Falta and Jucovic² report on an experimental research on guinea-pigs and rabbits in which injection of adrenalin seemed to completely *neutralize several times the fatal dose of strychnine*. This occurs whether

¹ Centralb. f. Gynäk., 1909, No. 44.

² Berliner klin. Wochenschrift, 1909, xlvii, 1929.

the adrenalin and strychnine are mixed and injected together, or injected at different points of the body, only in the latter case the adrenalin should be injected a minute before the other, thus proving that the action is physiological and not chemical. That the antidotal action is not due to delaying the absorption of the strychnine was shown by injecting dilute solutions in guinea-pigs so as to form a visible swelling under the skin. This fluid was taken up just as quickly if adrenalin were given with the strychnine as if it were not.

Reicher¹ demonstrated that *mouse cancer* (adenocarcinoma) would completely disappear when adrenalin is injected into the tissues surrounding the growth. The morbid tissue undergoes necrosis as the result of the injections. This is not due to the characteristic action of the drug on the bloodvessels alone, thereby causing starvation of the tissues, for the author endeavored to immunize animals against inoculation cancer by preventive injections of the drug, thereby showing, he believes, a specific action on the morbid tissue. Reicher is now testing the drug in human carcinomas with encouraging results.

Matthews² has used adrenalin solutions in thirteen cases of *acute asthma*; the results have been immediate relief, lasting for longer or shorter periods. The treatment consists of spraying into the nose a solution of adrenalin chloride varying in strength from 1 to 1000, to 1 to 4000, according to the severity of the case.

Agar-agar. The use of agar-agar has been resorted to by some practitioners for a considerable number of years for the relief of *symptomatic constipation*, and the question naturally arises as to the type of case in which it will prove most successful. Martinet³ employs carmine to determine the sluggishness of the alimentary canal. By using 15 grains of the drug in a cachet at the moment at which a meal is eaten, he then records the number of hours before the stool is passed colored by the dye. According to his observations, it requires from eighteen to twenty-four hours for food to traverse the alimentary tract in a normal adult, whereas in atonic constipation it is found that it does not appear in the feces for from fifty to one hundred and five hours or more. Agar-agar absorbs sixteen times its weight of water and promotes peristalsis by distending the intestine, thus it is valuable in that type of chronic constipation due to too little residue from the food. Again, in most cases in which the stools are particularly dry, so that they come away from the patient in hard, lumpy masses, Martinet directs that the patient shall use a liquid diet and shall drink very freely of water, and, under these conditions, he asserts that agar-agar is particularly useful, and that it is furthermore advantageous in that its employment is not proved to be followed by subsequent constipation.

¹ Deutsche med. Wochenschrift, July 21, 1910.

² British Medical Journal, February 19, 1910.

³ La Presse Medicale, March 30, 1910.

If taken at bedtime daily, it causes a large, soft stool without any colicky pain. The dose varies from 1 dram to 4 drams, and may be mixed with one of the fruit jellies or with marmalade, or it can be mixed with some vegetable ordinarily employed as a foodstuff. In order to enhance the peristaltic action, Martinet combines small doses of cascara with the agar-agar.

Alcohol. In spite of the many discussions on this subject, the question is still open as to whether alcohol should ever be used as a therapeutic agent. But if we are to be fair we must consider alcohol as any other drug, viz., describe its physiological action in therapeutic doses, its indications and untoward symptoms. Alcohol has been variously classed as a food, a stimulant, a vasodilator, a narcotic, a hypnotic, and a stomachic. Perhaps the most valuable therapeutic influence of this drug is its action *as a vasodilator*,

Osborne,¹ in discussing the subject, reminds us that vasodilatation is often indicated in feverish processes, in acute diseases, and at any time when the pulse tension is high and the surface circulation sluggish. If we can show the heart, dilate the peripheral capillaries, increase perspiration, and quiet nervous excitation and restlessness, the patient is not only more comfortable but in a safer condition, and is better able to withstand the acute disease. Alcohol, in proper doses, will do this. A rapid heart will become slower and more regular, the bloodvessels fuller and softer, the skin warmer, and the circulation will be in better equilibrium. Internal congestion will be relieved and the surface circulation improved. A dose larger than from one to three teaspoonfuls, once in three hours, is probably never indicated, and when given in prolonged fevers in this way one dose is oxidized or eliminated before the next one is administered, and its advantage under these circumstances lies in its dilatation of the peripheral bloodvessels with equalization of the circulation. But when alcohol is given freely the system cannot readily oxidize it, and it speedily accumulates and becomes poisonous in its effects.

As a vasodilator in chronic high arterial tension it should ordinarily not be used. This indication for treatment is present in arteriosclerosis and gout, and is a symptom and sign in late middle life or old age. If the condition requires treatment, it is much better managed by other drugs. If, however, the patient is well along in life and has been accustomed to take alcohol regularly, in moderate doses, it may be unwise to stop its use unless it is found that some other less harmful vascular relaxant can be substituted for it with equally good effects. In other words, the physiological relief from high tension which the patient has been accustomed to acquire by taking alcohol cannot be stopped abruptly without due consideration of the consequences of withdrawing the drug.

¹ Yale Medical Journal, January, 1910.

Within the last few years the treatment of intractable cases of *trifacial neuralgia* and *tic douloureux* has been completely revolutionized, says Leszynsky, through the introduction of the injection of alcohol into or in the neighborhood of the foramina of exit of the various nerve branches. Leszynsky reports fifteen cases of the alcohol injection treatment of trifacial neuralgia. This form of treatment, he says, when successfully applied, is virtually surgical nerve resection without a resulting scar. He believes there is no good reason today, with the evidence before us, why a patient should be subjected to a cutting operation, when the alcohol injection is equally, if not more, efficacious in the majority of cases. He gives the histories of fifteen patients who were successfully treated by this method.

Patrick¹ reports 75 cases of unmistakable *tic douloureux* that were treated by alcohol injections with marked relief in each case. Of the 75 cases, 36 patients were between sixty and seventy years of age, 13 between seventy and eighty years, and 1 over eighty years. Most of the patients were quite disabled by the disease, all had tried other forms of treatment, and a considerable number had undergone cutting operations. Patrick used an 85 per cent. solution of alcohol to which was added 4 grains of cocaine to the ounce. Of this solution about 2 c.c. are introduced each time. The injections are made with a straight needle about 10 cm. long, 1.5 mm. thick, and fitted with a stylet or obturator, the blunt end of which is flush with the needle point. The sharp point is used to puncture the skin after which the stylet is pushed home, making a blunt instrument for the remainder of the penetration. The needle is introduced at the lower border of the zygoma, the object being to reach the inferior maxillary division of the nerve at its emergence from the foramen ovale (about 4 cm. deep), and the superior, as it leaves the foramen rotundum.

Hecht² reports a series of sixty cases thus treated.

The mode of action of the alcohol in these conditions was demonstrated by Schosser.³ After numerous experimental studies upon animals, he discovered that alcohol in the strength of 70 to 80 per cent. when brought in contact with a nerve, produced a degeneration of all of its parts excepting the neurilemma. He claimed that the deadening of a nerve with alcohol is equal to a surgical resection.

In an editorial comment⁴ on "Alcoholism and the Germinative Cells," it was pointed out that it has long been believed, on the basis of clinical experience and statistical evidence, that paternal alcoholism may have a considerable and deleterious influence on the offspring. Forel in particular having contended that alcoholism injures the germinative

¹ Journal of the American Medical Association, December 11, 1909.

² Wiener. med. Woch., June 15, 1907.

³ Medical Record, June 18, 1910.

⁴ Journal of the American Medical Association, February 19, 1910.

cells. He supported this view with statistics from asylums for the insane and epileptics, and gave to the alteration in the germinative cells the title of "blastophtorie." Not only are nervous and mental defects attributed to paternal alcoholism, but also the collected histories of congenital cardiovascular anomalies show the presence of this influence to a degree that cannot well be dismissed as fortuitous. Even with experimental animals it has been found that chronic alcohol intoxication of the male leads to the production of a defective offspring, according to several observers.

In 1898, Simmonds, of Hamburg, reported that in 60 per cent. of chronic alcoholics azoöspemia was present. Bertholet¹ examined the testicles of 75 men whose history as to alcohol was known, of whom 39 were habitual users of alcohol in large amounts, and most of whom died before the fiftieth year. In all but 2 of these 39 alcoholics, a more or less marked atrophy of the parenchymatous elements and an increase in the interstitial connective tissue were found, these changes differing from the ordinary senile involution. Especially marked were the changes in the testicles of men who died of alcoholic cirrhosis; this coincidence of hepatic and testicular fibrosis has been observed previously by others, who, however, do not connect the changes in the testicles with the alcoholism. In proportion to the degree of atrophy present the process of spermatogenesis is defective, often with total absence of spermatozoa, or with abnormalities in the changes leading up to the formation of the spermatozoa. While chronic diseases, especially cancer cachexia, may cause similar changes, yet the frequency and advanced degree of testicular atrophy is characteristic of alcoholism. The relation of these microscopic changes to the recognized influence of paternal alcoholism on the offspring is evident.

Fahr in his observations concerning the anatomical changes resulting from chronic alcoholism, found them to be less marked in regard to renal and vascular lesions than has been believed by most of us, although fatty changes in the liver and chronic meningeal thickening were found very frequently in the bodies of hard drinkers.

Antidiphtheritic Serum. This subject has been gone over at length in previous issues of *PROGRESSIVE MEDICINE*.² Until recently the only means we had of giving diphtheria antitoxin was in the whole serum of the horse in which it had originated. Several investigators have evolved a practical method for eliminating a portion of the non-antitoxic serum substances and retaining the antitoxin. These *globulin preparations* have come into great favor with the profession in the past few years. Park,³ in comparing the globulin and whole serums, says that the effects of the globulin preparations have to be considered

¹ Centr. f. alleg. Pathol., 1909, xx, 1062.

² *PROGRESSIVE MEDICINE*, 1908, 1909.

³ Journal of the American Medical Association, January 22, 1910.

from two standpoints: Have they the curative substances of the whole serum, and, if so, have they any advantages, except in concentration, over the whole serum? Park has carefully observed the results following the injection of the whole serum, and of the Gibson, and the Banzhof modifications—the globulins. The tests were carried out with preparations made from portions of the same lot of serums. The rashes and after effects were undoubtedly much less after the Gibson injections than after the whole serum, and somewhat less after the injections of the Banzhof modifications than after that of Gibson. The curious feature about them were that only certain types of rashes were eliminated. The urticarial reactions still frequently followed.

The *Gibson process* of purification and concentration of the serum is based upon the fact that antitoxin is associated with the globulins soluble in saturated solutions of sodium chloride. This purification appeared to be considerable, as in the average normal horse serum the proteins are distributed as follows: Albumin, 40 per cent.; globulin soluble in saturated sodium chloride solution, 42 per cent.; globulin insoluble in saturated sodium chloride solution, 18 per cent. Thus it would appear as though 58 per cent. of non-antitoxic protein was eliminated.

More recently, Banzhof experimented with antitoxic serums heated at different temperatures and periods of time, and found changes taking place in proteins which allowed further purification of antitoxin; thus, if antitoxic serums of 600 units per c.c. containing albumin, 12 per cent., globulin carrying the antitoxin 78 per cent., globulin non-antitoxic 10 per cent., were heated for from twelve to fifteen hours at a temperature of 57° C., a rearrangement of the proteins would take place, so that albumin would now be 9 per cent., globulin and all the antitoxin, 50 per cent., and globulin non-antitoxic, 41 per cent., showing an elimination of 50 per cent. non-antitoxic proteins. The loss of antitoxin on heating for this period of time and temperature is from 5 to 7 per cent. The units per gram of coagulable protein for this serum would be 9446. With the Gibson process, using the same serum, we have 11,456 units per gram protein while with the heating method, we have 17,000 units per gram. One should bear in mind, however, that the producer can concentrate the antitoxin either by eliminating the non-antitoxic proteids of the serum or by lessening the percentage of water holding the proteids in solution. The latter expedient, if carried too far, is a detriment. Park¹ asserts that the globulin preparations contain all the important curative substances of the whole antidiphtheritic serum and without the objectionable features of the untreated serum.

Anderson² has recently studied the influence of age and temperature on the potency of diphtheria antitoxin. He used eighteen different

¹ Journal of the American Medical Association, vol. liv, No. 4, p. 253.

² Journal of Infectious Diseases, 1910, vol. vii, p. 481.

lots of diphtheria antitoxin, fourteen being the untreated horse serum, and four the globulin preparation. Each lot of serum studied by him was divided into three portions; one portion was kept at room temperature, one at 60° F., and the third portion at about 40° F. The potency of each lot was determined every six months for three years, at the end of which time the results were tabulated and published. Anderson found that the average yearly loss in potency of diphtheria antitoxin at room temperature is about 20 per cent.; at 60° F. about 10 per cent.; at 40° F., about 6 per cent. In some instances these percentages were increased. The keeping properties of the untreated serums and globulin solutions show but little difference. Anderson says that there should be no lack of confidence in old serums, and the only reason for not using such serums would be that a larger amount would have to be used to allow for the decrease in potency; he further adds that old serums, unit for unit, are just as potent as fresh serums, and would be perhaps less apt to cause severe reactions than fresh serums. He found that when diphtheria antitoxin was dried and kept in the dark at 40° F. it retained its potency practically unimpaired for five and one-half years. Anderson suggests that such a dried antitoxin might be of value for use on long voyages and in the tropics. Experimental evidence has shown that the *amount of diphtheria antitoxin needed to neutralize a given amount of toxin depends largely on the time interval between the two injections.*

In order to obtain more rapid and effective action of diphtheria antitoxin, Schreiber¹ was induced to try *intravenous injections* of the serum in serious cases of diphtheria instead of the subcutaneous administration. He has thus treated 20 cases of diphtheria, with only 1 death. This fatality occurred from cardiac paralysis on the thirteenth day. The child, aged ten years, received a subcutaneous injection of 2000 units and on the following day was much worse; 4000 units were then injected intravenously, which caused a slight improvement, but on the eighth day the heart became involved and five days later the patient died. Schreiber is in favor of giving single high doses, 6000 to 10,000 units, rather than to repeat the dose, in order to avoid a possible anaphylaxis. The intravenous injections, Schreiber believes, do not have as good an effect on the local processes as the subcutaneous injections, but the temperature falls more rapidly and at the same time the general condition shows a more rapid improvement. He further adds that the high doses injected intravenously combine more surely with the toxins and are more apt to prevent paralytic complications. If the intravenous injection is for any reason impossible, an injection deep into the gluteal muscle should be given, as it is more rapidly absorbed than a subcutaneous injection.

¹ Münch. med. Wochenschrift, 1909, xxxi, 1597.

Berlin¹ relates his experience with the *intravenous* and *intramuscular injections* of antitoxin in 120 cases of diphtheria. He found that from 4000 to 16,000 had a much quicker curative effect than smaller doses. The temperature became normal on the day following the injection in 34 cases, and in 28 cases it reached normal on the second day. The local inflammation in the throat showed a less marked improvement, but the general condition improved rapidly. In case of children, the intramuscular injections into the gluteal muscles are preferable. Berlin advocates this method when quick results are desired, and believes it to be devoid of any harmful effects. There were no by-effects and no disturbances even from these large amounts of antitoxin, notwithstanding that it contained a certain proportion of carbolic acid as a preservative.

Timmer² reports the results of serotherapy of diphtheria in Amsterdam and presents a number of tables which show the mortality of diphtheria before and after the serum period, with the incidence and mortality of operative cases. Between 1890 and 1894 inclusive, there were almost as many deaths as in the period between 1895 and 1908 inclusive; in other words, the number of deaths for five year before serotherapy was used were 411, and during fourteen years of serotherapy there were only 409 deaths. When expressed in percentages we have 37.8 under the old and 9.7 under the new regime. The highest annual death percentage under serum treatment was 12, lowest 3.5. The highest annual percentage of preserum period was 45, lowest 30. In the five last years of the preserum period, 55.5 per cent. of all patients came to operation (tracheotomy and intubation); while in the fourteen years of serotherapy, but 29 per cent. required surgical intervention. The material for these statistics comes entirely from two children's hospitals at Amsterdam.

Anaphylaxis. It will be recalled that this subject was discussed by me in PROGRESSIVE MEDICINE for 1908 and 1909. Doerr³ gives an excellent review on this subject covering most of the recent literature, and summarizes the most recent advances of anaphylaxis within the past two years. Many valuable contributions on this important question have been added, and our understanding of the real significance of the reaction of anaphylaxis has been much helped. By the earlier investigations it was shown that anaphylaxis reaction could be induced in certain warm-blooded animals by injection of almost any soluble protein at suitable intervals, the first injection rendering the animal hypersusceptible to the second injection of the same protein. All animals, however, do not react to such injections. The most marked and constant reactions occurring in guinea-pigs; white mice and rats

¹ Deutsche med. Woch., 1910, xxxvi, 210.

² Berliner klin. Wochenschrift, July 11, 1910.

³ Ztschr. f. Immunitätsforsch., 1910 (ii Ref.), p. 49.

seem not to react at all. In the blood of animals that have received a single dose of protein there appears a substance which renders the animal sensitive to the protein, so that if the blood of such a sensitized animal is injected into a normal animal this second animal is rendered hypersusceptible to the protein, a process of "passive sensitization." If the animal survives a second or intoxicating dose of the protein, it is commonly found to be no longer sensitive to the protein, this phase being termed as the stage of "antianaphylaxis" and is especially marked in guinea-pigs.

Rosenau and Anderson were first to maintain the view that the protein, which intoxicates the animal at the second injection, is identical with the protein which sensitized it after the first injection. This view is now believed by most investigators to be true. The first introduction of the abnormal protein into the circulation of the animal causes a reaction with the formation of some substance the "reaction body," which unites with the protein injected later to form a poisonous substance, the "anaphylatoxin." This formation of anaphylatoxin occurs not only when the protein is injected into a sensitized animal, but also when the serum of a sensitized animal is mixed with suitable quantities of the specific protein in the test-tube, the resulting mixture causing immediately the typical symptoms of anaphylaxis when injected into a normal animal. Friedberger contends that the reaction of the specific protein with the serum of the sensitized animal causes the formation of a body entirely analogous to the precipitate produced by the action of a precipitin on the specific protein, which, in the presence of the serum complement, is made soluble and toxic. He believes that the anaphylaxis reaction and the precipitin reaction are inseparably related. It seems probable that the fundamental reactions are the same in the formation of precipitins, agglutinins, hemolysins, bacteriolysins, complement fixation bodies, and the anaphylactic reaction body or sensibilin. In all cases alike, a foreign protein is introduced into the body of an animal which reacts by the production of immune bodies; these immune bodies may be demonstrated by observing their precipitating, agglutinating lytic, complement-binding, or anaphylitic reaction, the substances involved being the same and only the means of exhibiting their presence and action differing in each case. Doerr¹ reaches the conclusion that anaphylaxis finds a place among the other immediate reactions as above noted. There is much evidence in support of the view that the anaphylaxis reaction is in close relationship with the other known serologic reactions of immunity.

Attempts have been made to apply the passive sensitization phenomenon to clinical diagnosis, on the principle that if an individual suffering from an infection is sensitized to the infectious agent his

¹ Ztschr. f. Immunitätsforsch., 1910 (ii Ref.), p. 49.

blood when injected into an animal, should render the animal passively sensitive to the proteins of the infectious agent. As yet, however, no very satisfactory results have been obtained with bacterial injections, or with the serum of persons with echinococcus cysts, although the severe symptoms which occur when such cysts rupture have been ascribed to an anaphylactic reaction to the protein of the cyst contents. Rosenau and Anderson suggested that eclampsia may be in some way related to anaphylaxis, since guinea-pigs can be sensitized to extracts of guinea-pig placenta. This view has received some support by the finding that serum from eclamptic women will render guinea-pigs passively sensitive to human amniotic fluid, which indicates that the blood in eclampsia contains specific reaction bodies against the proteins of the fetal fluids. Pfeiffer believes that the serum of cancer patients, when injected into guinea-pigs, renders them passively sensitive to cancer proteins so that they react typically if extracts of cancer tissue are injected forty-eight hours later. This reaction is based on the assumption that cancers contain proteins which are specifically different from the normal proteins of the host. Much has been written for and against Pfeiffer's claim but as yet cannot be considered as an established fact.

Hutinel¹ reports 2 cases and knows of 2 others, still unpublished, in which *antimeningococcus serum* was given three, five, and forty-four days after the first injection, and serious nervous symptoms developed, proving rapidly fatal. The patients were children between three and six years, and the injections had all been made into the spine; from 25 to 30 c.c. of the serum had been injected each time. Hutinel says that ether and alcohol seem to confer a briefly transient immunity against anaphylaxis, and he adds that it is a popular notion in northern France that symptoms arising in certain persons after eating poisonous mussels are relieved by the ingestion of small amounts of ether. The symptoms induced by this mussel poisoning are not unlike those of anaphylaxis, and he suggests that the antianaphylactic properties of ether might be used in the treatment of serious disturbances following injection of antimeningococcic serum. Another prophylactic measure Hutinel suggests is to make the succeeding injection with a serum derived from another animal, a sheep, for instance, if horse serum had been used at first. In two of the cases Hutinel reports there was concomitant tuberculosis which may have aided in inducing the anaphylactic phenomena or at least in conferring greater gravity on them.

Besredka advocates rendering cattle immune to anaphylactic disturbances in serophylaxis by vaccinating them with the serum just beforehand. This method has recently been applied in Roumania on a large scale, Alexandrescu having used, in vaccinating cattle against

¹ Presse Medicale, Paris, June, 1910, xviii, p. 489.

anthrax, a mixture of antianthrax vaccine and serum. The animals are vaccinated against anthrax regularly once a year at least, and oftener in cases of epizootics; 90 out of 180 animals thus treated were given a subcutaneous injection of 1 c.c. of the antianthrax serum five hours before the vaccinating mixture was injected, and none of these animals showed any trace of anaphylaxis while 10 per cent. of the 90 other animals not receiving the preliminary injection developed symptoms indicating anaphylaxis.

Antigonococcic Vaccine. Hamilton¹ reports a series of 344 cases of vulvovaginitis in children of undoubted gonococcic origin. The microscopic examination of smears from the vaginal secretion in all these cases, when stained with Gram's method, showed the organism to be decolorized. In the 344 cases observed, the average age of the patients was 5.1 years; 151 patients were under 5 years, the remaining 193 over 5 years of age. The following table shows the duration of vaginal discharge previous to coming under treatment:

	Cases,	Average age, years.
5 years	3	8.2
4 years	4	7.6
3 years	2	8.1
2 years	9	8.0
1½ years	22	4.6
1 years	12	3.1
6 months to 1 year	52	4.5
6 months to 3 months	55	5.3
3 months to 1 month	42	5.9
Under 1 month	143	5.2

Of these cases there were 260 treated with irrigations, and 84 were treated with vaccines. All of these cases were out-patients reporting to the dispensary from time to time for treatment.

Hamilton used three separate vaccines in the 84 cases that were treated by this method.

1. Vaccine prepared from sixteen to eighteen-hour blood-agar cultures from acute male urethritis.

2. Vaccines from a stock culture at the Presbyterian Hospital.

3. Stock vaccines prepared by Parke, Davis & Co.

No attempt was made to use autogenous or personal vaccine from the patient's own organism. The injections were made, under strict asepsis, into the gluteal muscles with an ordinary glass hypodermic syringe. In using small quantities of the vaccines sterile physiologic salt solution was employed as a diluent. The number of vaccinations to the individual cases varied according to the age, severity, and chronicity, the smallest number being eighteen.

¹ Journal of the American Medical Association, April 9, 1910.

In the majority of cases, regardless of age (except under six months), the author started the treatment by an injection of 50,000,000 every fifth day, increasing the dose by 10,000,000 until five injections were given, *i. e.*, 90,000,000. The interval was now made ten days before another was given. Smears of the remaining secretion were taken and stained by Gram's method at each visit after the fifth injection. In the cases of long standing it was necessary to use an increased number of injections, bringing the dosage up to 200,000,000. In most of the acute cases six injections were sufficient for a complete cure. Occasionally an extremely slight local reaction took place, but this in every case subsided in twenty-four hours. The reaction was never sufficient to cause any pain or tenderness. General constitutional disturbances never occurred following any of the injections. Temperature charts were kept of the cases, the temperature being taken twice daily by the visiting nurse, who visited the patient's home while active treatment was being given. No local treatment whatever was used, except external bathing, if excessive discharge was present. No irrigations were given.

Of the 84 cases treated by vaccines, 16 were of long standing which had been treated by other methods. In the majority of these 16 cases, permanganate irrigations were previously used. Gonococci were present in all before the vaccine therapy was instituted. The latter cases required a larger number of injections and an increased dosage. No patient was pronounced cured unless free from the gonococci by Gram's method, once weekly for four weeks, and two additional examinations at intervals of two weeks. If no discharge was evident and no gonococci were present after these six examinations the child was considered as cured. No evidence of infection was present three months after the sixth examinations in the 19 children that were thus examined. The following is a table showing the results of treatment by the irrigation, and vaccine method of treatment:

Treatment.	Total number of cases.	Cured.	Uncured.	Lost.	Per cent.
Irrigation	260	158	53	49	60
Vaccines	84	76	5	3	90

The average length of time under active treatment by the irrigation method, in 260 cases, was ten and one-tenth months.

The average length of time by the vaccine method in 84 cases was one and seven-tenths months.

In conclusion, Hamilton says that vaccine therapy has a place in the treatment of this infection in little children for the following reasons:

1. The short time required for a cure in over 85 per cent. of cases.
2. The ease of administration of the vaccine; no special apparatus or knowledge of technique being necessary.
3. The vaccine is apparently harmless when used under aseptic precautions.

5. It is not necessary to take the opsonic index, with its complicated technique.

6. It eliminates irrigations which direct the child's attention to its genitals, at times encouraging precocious masturbation. The frequent douches necessary in the irrigation treatment will, with the best care and gentleness, produce some injury when continued over a long period of time.

Butler and Long¹ reported 25 cases, and Churchhill and Soper,² 41 cases of vulvovaginitis in children treated by vaccine therapy.

Weinstein³ treated 28 cases of vulvovaginitis in children, and says that in every case in which the gonococcus was found by bacteriologic test the cure was complete. The minimum number of injections used was three, the maximum nine. Most patients, before vaccinothrapy was used, had been treated very frequently for six months and more by means of various drugs without any effect. Schindler⁴ has obtained the best general results from vaccinothrapy in epididymitis and diseases of the adnexa, together with gonorrheal arthritis. Failures must be expected at times says Schindler, and coincide chiefly with the presence of mixed infection. This necessitates a guarded prognosis, for it is in precisely these affections (annexitis, epididymitis, arthritis), that mixed injection is most likely to be encountered.

Stellwagen,⁵ in reporting 15 cases of which 10 were cured, 3 improved, and 2 were unaffected, arrives at the following conclusions:

1. Acute and chronic urethritis do not yield to serum treatment, but the use of serum renders the patient more readily amenable to local treatment.

2. Prostatitis is frequently benefited by the use of the serum.

3. Epididymitis has often been cured by its administration.

4. In gonorrheal arthritis the antigonococcic serum has proved to be practically a specific.

5. In gonorrheal complications we believe serum treatment is indicated.

6. No inconvenience was experienced by the patients other than a slight eruption, which soon disappears.

Tetanus. The eighth annual summary of the Fourth of July casualties for 1910 was published in the *Journal of the American Medical Association* on September 3. The returns this year are most encouraging, since they show an enormous reduction in the number of deaths and of injuries. The totals are the lowest since *The Journal* began the compilation of these statistics in 1903. The reason for this marked reduction in both deaths and injuries is clearly due to the adoption of

¹ Journal of the American Medical Association, March 7, 1908.

² Ibid., October 17, 1908.

³ Therapeutic Review, September 15, 1909.

⁴ Berliner klin. Wochenschrift, August 1, 1910.

⁵ Therapeutic Gazette, April 15, 1910.

saner methods of celebration by several of our larger cities, and by hundreds of smaller ones.

There were 72 cases of tetanus this year, the lowest number reported during the eight years that *The Journal* has been gathering these statistics and less than half the number of last year, when 150 cases were reported. It is a significant fact that the number of blank cartridge wounds shows a correspondingly large decrease, from 1225 last year to 450 this year. It is interesting also to note that, since they form the most prolific cause of tetanus wounds from the formerly considered "harmless" blank cartridges, they result in a higher percentage of deaths (12.7) than those from loaded firearms (10.2 per cent.). The most common cause of the wound is the blank cartridge, and the most common site is the hand. Blank cartridges continue to be responsible for the great majority of tetanus cases, 64, or 88.9 per cent., this year being due to that cause as compared with 86.5 per cent. last year, 73.3 per cent. in 1908, 71 per cent. in 1907, and 60 per cent. in 1906.

TABLE SHOWING CAUSES OF TETANUS CASES.

Year.	Blank cartridge.	Giant crackers.	Cannon.	Firearms.	Powder, etc.	Total.
1903	363	17	5	3	27	415
1904	74	18	5	1	7	105
1905	65	17	4	5	13	104
1906	54	17	1	7	10	89
1907	52	8	6	4	3	73
1908	58	5	4	3	6	76
1909	130	9	1	4	6	150
1910	64	2		5	1	72

With the full knowledge of the dreadful character of the deaths caused by blank cartridge wounds, it is certainly inexcusable that the use of these articles is not absolutely prohibited. Five cases of tetanus this year were from gunshot wounds, 2 were due to injuries by firecrackers, and 1 was caused by a dynamite cap. Of the 72 cases of tetanus from Fourth of July injuries this year, 67, or 93.1 per cent., ended fatally as compared with 84 per cent. last year, 72 per cent. in 1908, 85 per cent. in 1907, and 84 per cent. in 1906.

Besides the cases of lockjaw due directly to Fourth of July fire works, it is interesting to note also those due to penetrating wounds from other causes, such as nails, splinters, or crushing injuries, etc. There were only 47 such cases reported during the Fourth of July season this year or about one-third the number of last year, when 128 were reported.

TABLE SHOWING CAUSES OF DEATH NOT DUE TO TETANUS.

Year.	Fire from Powder, fire torpedoes, Giant Gunshot. crackers. etc. crackers. Cannon.					Other causes.	Total.
1905	37	23	6	5	7	17	95
1906	38	18	18	3	3	3	83
1907	20	31	13	13	3	22	102
1908	30	22	19	23	7	7	108
1909	17	37	16	7	7	6	90
1910	19	26	11	2	3	3	64

The decrease in the number of injuries is most remarkable this year and unquestionably is the result of the efforts to secure more intelligent methods of celebration. This is evident from the fact that the most marked decreases are in the States which heretofore have had the largest numbers injured, and where the agitation for restrictive measures was strongest. Massachusetts this year had only about one-seventh of the injuries it had last year; Missouri, New Jersey, and New York reduced their injuries to one-third, and Illinois and Ohio had one-half of their last year's totals. Pennsylvania reduced its total to two-thirds of what it had last year. Pennsylvania continues in the lead with 623 injuries, followed by New York with 327, and Illinois with 285. Last year the same three states had respectively 986, 897, and 546 injuries. Altogether there were 2923 injuries this year, a little more than half of last year's record.

Restrictive or prohibitive ordinances have done much in reducing Fourth of July casualties. Trenton, N. J., adopted a prohibitive ordinance following last year's celebration, and as a result presents a clean record this year. One solitary injury is reported this year from Cleveland, which adopted a prohibitory ordinance two years ago. Washington also has a prohibitive ordinance and for two years has had a clear record. Baltimore, with a prohibitive ordinance, reports only six injuries and no fatalities this year. These records clearly show that prohibitive ordinances are more effective than restrictive measures, such as were employed in New York, Chicago, and several other cities. Reports from hundreds of smaller cities and towns indicate that this year either prohibitive or restrictive measures were enforced. The agitation for more enlightened methods of celebration has been rapidly spreading and the greatly reduced list of casualties this year is the result.

Antityphoid Vaccine. Richardson¹ points out the fact that in vaccine therapy the aim is the production of an active immunity. Therefore, success in this method of treatment presupposes that the patient is not already completely overwhelmed by the infection. Furthermore,

¹ Journal of the American Medical Association, January 22, 1910.

if this procedure is to bring about, as it should, increased bacterial destruction with the setting free thereby of an increased amount of endotoxin, this destruction must not be too rapid or excessive, lest efforts to cure do harm through hyperintoxication. Bacterial immunity is brought about through the action of a great variety of different, though related, immune substances, and, as a result of inoculation with vaccines, there may be formed antitoxins, antiendotoxins, lysins, agglutinins, precipitins, opsonins, and other allied products.

By bacterial vaccine is generally meant a culture of the special organism sterilized by heat, or otherwise, and suspended in known proportions in normal salt solution. Living organisms, attenuated either in number or virulence, have been used in a few instances. Richardson mentions the work of Strong, in the Philippines, who inoculated plague bacilli of attenuated virulence in order to produce in human beings a much stronger immunity than could be accomplished by dead bacilli. Living typhoid bacilli and tubercle bacilli have also been used, and favorable results have been reported. Richardson advises the use of autogenous vaccines in preference to stock cultures. No definite rules can be laid down as to dosage. It is advisable to begin well below what is considered the ordinary dose and gradually to increase. The interval between doses will vary in different infections. Richardson says that there can be little doubt that infections of the urinary tract due to the colon bacillus are favorably affected by vaccine treatment. Vaccines have also been used with favorable results in the treatment of gall-bladder fistula, and in cases of appendicitis where pure cultures of colon bacilli were obtained. The author calls attention to the inoculation of large numbers of troops in the British army against typhoid fever, as reported recently by Leishman.¹ Of 5473 soldiers inoculated, only 21 were subsequently infected, with 2 deaths, while of 6610 non-inoculated in the same regiment, 187 had typhoid and 26 died. The experience of the Germans has not been so extensive, but confirms these results. In a series of 424 cases of enteric fever, there was a mortality of 11.9 per cent. of the 324 patients that were not inoculated, and only 4 per cent. in the remaining 100 that were inoculated.

The adoption of this method of prevention by various foreign military services, and the recent introduction of the same procedure into the army of the United States, makes it not unreasonable to suppose that its use in civil life will be generally adopted within a comparatively short while. Antityphoid vaccination should recommend itself in large institutions, where physicians, nurses, ward tenders, laundry women, etc., are frequently exposed to typhoid infection. It has also proved itself to be a practical measure of prophylaxis in the handling of typhoid epidemics in several communities.

¹ Journal of the Royal Army Medical Corps, February, 1909.

Hartsock¹ gave 1100 inoculations in 563 persons. The ages ranged from fifteen years up, but mostly those of military age—from twenty-one to thirty-five years. No untoward results were noted; all patients recovered promptly, and in the severe cases the patients were able to attend to duty after twenty-four hours. A small percentage of patients had severe rigors, slight general erythema, diarrhea, and vertigo, and one had epistaxis.

The following figures show the reactions:

TABLE 1.—REACTION IN 563 CASES.

	First dose.		Second dose.		Third dose.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
None . . .	55	9.8	66	12	1	50
Mild . . .	471	83.7	436	81	1	50
Moderate . . .	31	5.5	29	6		
Severe . . .	6	0.1	4	1		

In the 563 cases, 56 men stated that they had previously had typhoid fever. On these, the percentage of reactions was as follows:

TABLE 2.—REACTION IN 56 WITH A PREVIOUS TYPHOID.

	First dose.		Second dose.	
	Number.	Per cent.	Number.	Per cent.
None.	10	17.8	9	16
Mild	41	73.3	42	79
Moderate	5	8.9	3	5
Severe	None		None	

Of the 1100 vaccinations the reactions were as follows:

None	122, or 0.11 per cent.
Mild	908, or 0.83 per cent.
Moderate	60, or 0.05 per cent.
Severe	10, or 0.001 per cent.

Herz² calls attention to the increase in the agglutinating property of the patient's serum noticed regularly after injection of the curative serum. Nothing of the kind was observed in a corresponding number of controls. It seems possible, he says, that this increase in the agglutinating properties after injection of antityphoid serum, perhaps also of normal horse serum, may prove a differentiating sign available in the earliest stages of typhoid before the ordinary test elicits a positive response. There were no positive findings in any febrile infectious diseases except typhoid. Chantemesse³ reviews the history of antityphoid inoculations, referring to his own pioneer work in this line in

¹ Journal of the American Medical Association, June 25, 1910.

² Wiener klin. Wochenschrift, December 16, 1909, 1737.

³ Bull. de l'Académie de Médecine, Paris, November 30, 1909.

1888, when he immunized mice by inoculation with killed typhoid bacilli. He later vaccinated his pupils and assistants in his hospital service where professional typhoid infection was very frequent. The agglutinating power of the serum increased in consequence of the inoculation to 100, 150, and 200 in a few weeks and gradually declined as time progressed, but the fixation period reaction has continued for many years after. One of his former assistants swallowed several drops of a culture of typhoid bacilli while aspirating it into a pipette, but no symptoms followed; it seems highly probable that the anti-typhoid inoculation ten years before was responsible for the harmless outcome of the incident. Chantemesse had three accidents of this kind among his assistants before the inoculations were attempted, one interne succumbing to perforation of the intestines in the severe typhoid developing six days after aspiration of the typhoid bacilli.

Chantemesse¹ and his colleagues have treated 1000 cases of enteric fever with serum treatment, with a death rate of 4.3 per cent. Of 5621 patients who were given routine treatment during the same period, 17 per cent. died. Of patients who were given serum treatment before the seventh day, not a single death occurred. The serum treatment is combined with the cold-bath treatment, and calcium chloride is given as a routine measure to prevent hemorrhage. The results of Chantemesse have been confirmed to a certain extent by von Leyden,² who reports three cases treated with an antitoxic serum prepared by Meyer and Bergell. These cases were all of a remarkably short duration, having normal temperatures on the sixteenth, seventeenth and nineteenth days. Walters and Eaton³ reported a series of 30 cases treated with vaccines, and Smallman⁴ a series of 36 cases. These series, though small, show favorable results. Walters and Eatby⁵ report a further series of cases treated by the hypodermic administration of vaccines made from dead bacilli. They give in detail the histories of a family consisting of a mother and three children, all attacked by enteric fever at the same time. Two of the children, who received vaccines, improved rapidly, and soon after treatment was begun the temperature fell quickly and approached normal. The youngest child, who had been least sick, was not inoculated; it became progressively worse, the temperature reaching 104.8° F. on the fourteenth day of the disease. The vaccine was then administered, which was followed by a marked improvement of all of the clinical symptoms and a rapid fall of the temperature. Of the 77 cases of enteric fever treated by them in 1908, 31 received the vaccine treatment, the remaining cases received the ordinary routine treatment. The mortality of the cases

¹ Hyg. gén. et appliq., 1907, p. 577.

² Med. Klin., August 4, 1907.

³ Medical Record, January 16, 1909.

⁴ Journal of the Royal Army Medical Corps, February, 1909.

⁵ Boston Medical and Surgical Journal, 1909, vol. xvi, p. 509.

treated with vaccines was 3.2 per cent. as compared with a mortality of 11.1 per cent. in the cases not thus treated. Walters and Eaton believe that the early administration of vaccines shortens the duration of the disease and also lessens the severity of the symptoms.

Irwin and Houston¹ report a case of a typhoid carrier in whom vaccine therapy was used. The bacilli were found in this patient's urine seven years after the original disease. After three months' treatment with inoculations, the bacilli entirely disappeared from the urine. Richardson² relates his experience with 25 cases in whom typhoid vaccines were used. The inoculations seemed to have had a favorable effect on relapses. In the 25 cases inoculated, there was but a single relapse after inoculation. This was very atypical and lasted six days.

Of 77 untreated patients, 10 suffered typical relapses. He is of the opinion that whatever effect the vaccines may have on the original disease, there can be little doubt that the percentage of relapses can be much reduced by bacterial inoculation.

Balsam of Peru. Balsam of Peru has been used with success by many surgeons in the treatment of *wounds*, Sickmann's³ experimental studies and clinical experience with this drug have confirmed, he says, the great advantages of this method of treating recent accidental wounds. A compress is placed over the wound while the vicinity is scrubbed, shaved, or washed with alcohol and benzine, and painted with tincture of iodine. The compress is then removed until bleeding points are arrested, the superficial wound secretions mopped up and without any further preparation or sterilization, the balsam is poured into the wound until it overflows, after which a dry sterile dressing is applied; this dressing is not changed for a week unless fever or other signs of infection develop. He has also found it extremely useful in old torpid processes to stimulate them to more active repair, and in operations on the joints he has used the balsam, instead of tamponing, to fill up and thus close the holes left by drains. Sickmann never observed any inconveniences resulting from the use of the balsam; it seems to have a slow, but unmistakable antiseptic action on the germs commonly encountered in recent wounds, while its physical and chemical properties oppose putrefaction and promote chemotactic action which enhances the local resistance.

The tendency of this drug to irritate the kidneys has been pointed out in *PROGRESSIVE MEDICINE*, 1908, and, therefore, it should not be used indiscriminately. This irritation seems to be particularly marked when the balsam is applied over a large area of skin, as in the treatment of scabies.

¹ *Lancet*, London, January 30, 1909.

² *Journal of the American Medical Association*, vol. liv, p. 256.

³ *Deutsch. Zeitschrift für Chirurgie*, Leipsic, March, 1910.

Calcium. Calcium salts and their effect on metabolism has attracted considerable attention in recent years. Their relation to tetany and their usefulness in "*serous hemorrhages*" or exudates and their use in *epilepsy* have been discussed before.¹

Towles² found that calcium, given in the form of the lactate, enters into the general metabolism or allows the calcium already present in the body to be utilized without loss. Given by the mouth, there is no toxic effect from the administration of 20 grams of calcium lactate over a period of fifteen days. The calcium metabolism of Basedow's disease shows no special peculiarity; it runs parallel with the nitrogen, and in those periods of the disease in which there is a loss of nitrogen there is also a loss of calcium—a parallelism which is found in other pathological conditions.

Russell³ bases his treatment of pulmonary tuberculosis on the assumption that the dietetic cause of the disease is lime starvation. It is a well-known fact that lime forms about three-quarters of the total mineral solids of the body, and is found in all tissues and fluids. Some of the calcium salts are necessary for physiological activities to take place. Because of this widespread occurrence and specific influence on body processes, and because certain conditions of ill health are associated with a lessened amount of lime in the organs, it has naturally been a subject of speculation whether disease may not be the result of a deficient supply of this element. Russel, therefore, uses lime phosphate, casein, and hydrochloric acid together, as the best combination; they must be present in the stomach at the same time for assimilation to readily take place.

Chiavi and Januschke⁴ report experimental research which showed that the subcutaneous injection of calcium salts was able to *prevent the formation of pleural effusion* in poisoning with sodium iodide, thiosinamin, and diphtheria toxin in dogs and guinea-pigs. It also prevented the development of inflammatory edema in the conjunctiva of a rabbit after instillation of oil of mustard. It seems evident that the calcium not only renders the blood less fluid but seems to make the vessel walls less permeable. Wright has also reported similar results in *urticaria* after serotherapy. Chiari and Januschke believe that it may be possible by this means to influence the development of effusions in the clinic.

Lake⁵ finds that with scarcely an exception *rhinorrhea* has responded to calcium chloride. He gives 30 to 40 grains a day for two weeks. If this objectionable symptom recurs, it will again yield to this treatment. He does not attempt to explain the pathology, but thinks that

¹ PROGRESSIVE MEDICINE, 1908, 1909.

² American Journal of the Medical Sciences, July, 1910.

³ Medical Record, November 22, 1909.

⁴ Wiener klin. Wochenschrift, March 24, 1910.

⁵ British Medical Journal, July 9, 1910.

perhaps the amount of chloride in the blood may yield a hint as to the causative factor. The salt, he thinks, may possibly be of use in spasmodic sneezing, hay fever, or asthma.

Simpson,¹ in his clinical experience with calcium lactate in *hemorrhages of the upper air tract*, reaches the following conclusions:

1. Clinical experience shows that calcium lactate has a controlling influence in hastening the coagulability of the blood.
2. Its efficacy is more marked in hemophilic cases where the coagulation is delayed, than in cases of normal coagulation time.
3. Before operation, especially on tonsils, careful inquiry should be made relative to any hemophilic heredity or tendency.
4. In suspicious cases, the coagulation period should be determined before operation.

5. It is questionable, if not positively contraindicated, whether such operations should be undertaken in hemophilic cases, other than under the most extreme urgency.

6. In all cases of operations for the removal of tonsils and adenoids, calcium lactate should be given for a period prior to and after the operation, both for its possible effect in diminishing the immediate hemorrhage and in preventing secondary surface hemorrhages.

7. Of the calcium salts, the lactate is more positive in its results, is more agreeable to administer, and is less irritating to the stomach.

Cod-liver Oil. Researches on the metabolism in *rachitis* by Schabad² have shown a favorable modification of the disease under the influence of cod-liver oil, plus phosphorus. The proportion of lime retained is much larger under cod-liver oil; phosphorus alone has no such influence, but he found that phosphorus given with the cod-liver oil materially enhanced the action of the latter in this respect. He gives the phosphorus in a 1 per cent. solution in olive oil; three drops of the mixture represent 0.1 gram of oil and thus 1 mg. of phosphorus. The dose is one drop three times daily. Sesame oil failed to show any influence on the retention of lime. The combination of phosphorus with cod-liver oil increases not only the amount of lime retained, but also the retention of phosphorus, while it promotes absorption of nitrogen and fats.

This specific curative action of cod-liver oil in *rachitis* has been confirmed by Rosenstern's³ report on his extensive experience with the treatment in the children's asylum at Berlin, which is in charge of Finklestein. The results were so conclusive that Rosenstern affirms that this method of treatment may be counted on to cure in the majority of cases of *spasmophilia*, especially when phosphorus is combined with the cod-liver oil. In five cases of *craniotabes*, remarkable benefit

¹ Medical Record, September 25, 1909.

² Zeitschrift für klin. Med., Berlin, lxxix, pp. 393, 508.

³ Berliner klin. Wochenschrift, May, 1910.

followed the administration of 25 grams of cod-liver oil daily for from three to six weeks. In the *spasmodic diathesis*, cod liver also displayed marked efficacy. Phosphorus in ordinary oil or in emulsion displayed no influence on the spasmophilia. Rosenstern uses 0.01 part of phosphorus to 250 parts of cod-liver oil for the severest cases, and administers a teaspoonful of this five times daily. Cod-liver oil if given in larger doses seems to have the same effect without the addition of the phosphorus. Rosenstern estimates the severity of the rachitis by the extent of the craniotabes, representing it by a square that comprises the extreme limits of the softening of the bones, noting how this square grows smaller during the course of the administration of the cod-liver oil. The severity of the tendency to convulsions or allied phenomena—spasmophilia—is estimated by electric irritability of the nerves, especially the cathodal opening contraction. A very accurate index of the severity of the spasmophilic diathesis is proved by this method, especially when the response is compared with the Chvostek sign and other spasms.

Chloroform. Fitch¹ has obtained excellent results from the use of chloroform in 19 cases of *pulmonary hemorrhage*. Fitch states that the routine treatment of *hemoptysis* has always been uncertain and empirical because of the inaccessibility of the bleeding point. He explains the action of chloroform by a lessening of the heart action, a reduction of the blood pressure, and a diminution of the respiratory movement. Fitch believes it is possible that the hemostatic action of the chloroform may be aided by direct contact of the vapor with the bleeding point, since the drug produces coagulation of the blood *in vitro*. The patient is placed in a semirecumbent position, and from 2 to 4 c.c. of chloroform is gradually used in an ordinary inhaler, as if chloroform were being given for the production of surgical anesthesia. Results should occur within five to ten minutes, but in certain instances it may be advantageous to give from 15 to 20 drops every hour for a few days to prevent a recurrence. Small doses of chloride of ammonium with codeine are given internally to aid expectoration and prevent excessive cough, and mild purgation with magnesium sulphate is resorted to in the removal of excrementitious matter which, if retained in the blood, would stimulate the vasomotor centre and raise the blood pressure.

Giani² reports, from Durante's clinic at Rome, two cases in which chloroform was used *intravenously*, saturated in a salt solution and injected into the saphenous vein; 1100 c.c. of fluid were used in the first case, representing 6.6 grams of chloroform. The anesthesia lasted for forty-five minutes; seven minutes after cessation of the infusion the patient roused. In the second case, 1500 c.c. of fluid were used, which contained 9 grams of chloroform; the operation lasting seventy-five minutes. Giani was favorably impressed with this technique

¹ Journal of the American Medical Association, 1909, vol. lii, p. 1918.

² Policlinico, Rome, December 10, 1909, p. 1605.

for operations on the head and throat. Burkhardt,¹ of Wurzburg, has experimented on a series of animals, and has given chloroform intravenously to four patients, and regards this as a safe and agreeable method of narcosis. The recovery from the narcosis was much more rapid and there was a marked absence from any untoward symptoms. Sippel,² under the title "A Typical Clinical Picture of Tardy Death from Chloroform," reports his own case and reviews the forty articles he has found in the literature. In nearly all of the reported cases marked interference with the systemic blood current was brought about by the surgical procedure and believes that certain toxins were thus produced which had a special injurious action on the hepatic parenchyma. Sippel's case was that of a young woman seemingly healthy, save for some tendency to chlorosis, who inhaled about sixty grams of chloroform given by a skilled anesthetist. No other anesthetic was combined with chloroform. All went well until the following day, when the patient became restless, vomited, and showed the evidences of circulatory disturbances by a soft rapid pulse. The abdomen was flat and not sensitive save in the liver region, where some tenderness was elicited. The eyes were slightly jaundiced. There was much albumin in the urine, and the patient manifested the stupor of eclampsia. Vomiting, jaundice, and failure of the heart became more pronounced, and the woman died within sixty-eight hours after the abdominal section. Autopsy showed marked fatty degeneration of the liver without peritonitis or other evidences of inflammation, or of infection at the site of operation.

McCown and Fontaine³ report the case of a young negro woman in whom two chloroform anesthetics, in quick succession, were used for the relief of *bleeding following an incomplete abortion* at third month. Forty-eight hours after curettement, jaundice developed, with nausea, vomiting, rapid pulse, and delirium. Convulsions followed with coma, and death occurred five days after the operation. At autopsy, the characteristic lesions of delayed chloroform poisoning were noticed.

Whipple⁴ and Sperry reach the general conclusions, from the results of experiments which they believe prove beyond doubt that chloroform is a powerful poison, that narcosis with this drug for any considerable length of time invariably causes central necrosis of the liver (in animals), and that this necrosis, if extreme, will cause death. The essential change is an extensive necrosis and fatty degeneration of the liver. There may be numerous ecchymoses and hemorrhages into the peritoneum or upper intestinal tract. The pancreas may show many areas of fat necrosis and ecchymoses. The kidney and heart may present

¹ Münch. med. Wochenschrift, August 17, 1909.

² Archiv für Gynäkologie, vol. lxxviii, No. 1.

³ Journal of the American Medical Association, July 30, 1910.

⁴ Bulletin of the Johns Hopkins Hospital, September, 1909.

a moderate grade of fatty degeneration. Repair is effected by solution of the necrotic liver cells and rapid multiplication of the remaining peripheral cells. Cirrhosis does not follow extensive central necrosis and repair.

Diet. The general subject of fever was discussed by W. G. MacCallum in an interesting Harvey Lecture. He believes that no matter what the exciting cause of the fever be we cannot regard it as the mere effect, the injurious agent on the passive body, but must rather look on it in the light of an elaborate modification of chemical processes evolved in the course of centuries of development to answer some special purpose. In other words, it seems probable that every detail of the febrile reaction is one which is best calculated to take its own special part in the making up of a well-aimed plan, and this view receives support from the fact that with the onset of an acute infection there is usually a sharp rise in temperature, and that, after the attacking infection is conquered, the fever speedily falls. MacCallum also thinks that the changes in metabolism which are associated with fever, while difficult to comprehend, are nevertheless designed to play their part in the general plan, which is one devised for the good of the organism. He goes so far as to express his conviction not only that the febrile process is an action beneficial to the organism, but believes that it is intimately associated with the development of protective substances to combat the injurious agencies which have invaded the body.

Another point of great interest in this connection is one which MacCallum carefully considers, namely, the question of *tissue waste* and *food values in fever*. Thus, he quotes Paton, who found, from experiments on animals, that simple elevation of temperature increased the rapidity with which the glycogen of the liver is converted into glucose, and this investigator also found that in infective fevers the same rapid process occurs.

Hollinger, studying the sugar content of the blood in health and in fever, found that it was greatly increased in the latter condition, but glycosuria did not develop. It has been held by some that by the administration of carbohydrates during fever the destruction of protein substances is diminished, and others have found that if an animal is rendered glycogen-free, fever cannot be produced in it. As soon, however, as the glycogen is restored, fever develops.

It is evident, however, from various investigations, that the carbohydrates are utilized in fever, and that they may be employed to protect, to some degree at least, the proteins which otherwise would be rapidly destroyed.

H. A. Hare has for many years advocated a more generous feeding of febrile patients. He has not advocated great quantities of food, but a diet which was mixed and which did not adhere to one particular article. We have never been able to see, he says, why a patient who

is suffering from a prolonged illness, like typhoid fever, should be made to subsist solely upon milk, or other proteid form of food. There is no evidence that we know of which shows that the ability of a febrile patient to deal with carbohydrates, when they are properly prepared, is not as great as his ability to deal with proteids. Even if this difficulty does exist, it can be overcome by the administration of taka-diastase or pancreatin, given simultaneously with the starchy food.

Houghton,¹ in an exhaustive study of high caloric diet in typhoid fever, also favors a mixed diet, and has this to say in regard to the use of plain or fermented milk:

"There are many disadvantages in the use of milk, referable to its chemical composition. According to Dreschel, 9 per cent. of the nitrogen in casein can be separated directly by hydrolytic splitting into urea, this portion being of little service to the organism. The casein molecule contains 7 per cent. tyrosine and 1.5 per cent. tryptophane, which, under the influence of bacteria, yield toxic phenol and indol compounds. It contains no glyocol. To the chemist, casein is easily disintegrated, for it contains no peptones of the antigroup. Its use in practice demonstrates that when caseinogen is converted to casein by the action of lime salts, large curds form in the stomach and intestines, limiting the action of enzymes to the exterior surface, while bacterial processes continue on the interior. Sassetzky found that the loss of nitrogen on a milk diet in typhus ranged as high as 24 per cent. The absence of curds from the stools does not demonstrate the utilization of the casein molecule, sufficient time elapsing while traversing the gastro-intestinal tract to allow of bacterial disintegration. Impure, it adds infection to the intestinal contents." Houghton believes a soup diet is probably the best, and gives directions how it is to be made and how administered.

Rubner tells us that to cover a requirement of 2400 calories daily, 3410 grams of milk would be needed, which contains 140 grams of protein. This is more than twice the amount of protein contained in Chittenden's dietary for the normal man. It holds, preformed in its molecule, carbon nuclei which are capable of great evil, and does not contain those which are obviously of the most service. Shaffer and Coleman,² as a result of their exhaustive experiments, reach the following views regarding protein metabolism in typhoid fever:

1. By the use of diets of high caloric value and especially rich in carbohydrate it is possible to retard and, if the carbohydrate supply be sufficient, to prevent the febrile loss of body protein nitrogen in subjects of typhoid fever.

¹ Archives of International Medicine, December 15, 1909.

² American Journal of the Medical Sciences, January, 1910.

2. By such dietetic treatment the "toxic" destruction of body protein, as well as the destruction due to simple pyrexia in this disease, may therefore, be either prevented or compensated for.

3. The behavior of keratin and of total sulphur in their experiments appears to show that the febrile destruction of body protein, including the action of pyrexia and of toxins, is actually retarded or even wholly prevented by the intake of sufficient carbohydrate.

4. The prevention of the febrile loss of body protein is, therefore, not to be explained by a mere compensatory retention of food protein.

5. The results support the belief that in fever there is a greater need for carbohydrate; that if the food does not contain sufficient carbohydrate the body protein is drawn on perhaps to supply energy in an available form; but that, if sufficient carbohydrate be available from the foods, the body protein is protected from the febrile destruction.

6. If, as seems probable from their results, the "toxic" destruction of body protein may be prevented by large carbohydrate intake, the mechanism of this "toxic" destruction cannot be a direct (poisonous) injury to the body cells and proteins.

7. To maintain nitrogen equilibrium in typhoid fever the food must contain 10 to 15 grams of nitrogen in addition to much carbohydrate. Their experiments show no advantage from a further increase of food protein.

The *dietetic treatment of obesity* as advocated by many different observers has been reviewed by Strauss.¹ The Karell "*milk cure*," and the Rosenfeld "*potato cure*," he thinks, are practically starvation diets. They are applicable to those patients who can be kept in bed or at rest. These diets are especially low in protein, so that the nitrogen equilibrium is not maintained. Consequently part of the loss of weight in such cases is due to the loss of protein substances from the body. Strauss' opinion is that a more liberal though definite diet and a regulated manner of living have more permanent effects than the so-called short "cures." Since the course of the disease is essentially chronic, an endeavor should be made to regulate the diet and the mode of life for an indefinite time. The selected diet should be both satisfying and nutritious, and as nearly like the usual diet of the patient as possible. In other words, Strauss would prefer to treat the individual case of obesity rather than to treat by a definite plan. He gives some general rules, and tabulates the different articles of food according to their caloric value. He divides these into three classes—foods of high caloric value, those of poor caloric value, and those of moderate value. In a proper diet the protein content should be from 100 to 120 grams, which is equivalent to from 400 to 500 calories.

The tables which Strauss gives are valuable and offer a great variety of foodstuffs to choose from. Some general rules which he follows

¹ *Therapeut. Monat.*, 1909, 1, 17.

in diet are valuable. He uses meat in amounts of not more than 300 grams a day. The whites of hard-boiled eggs, and fat-poor cheese may be added to supply the necessary amount of protein. Green vegetables and various salads add variety to the diet. Potatoes are allowed, and are valuable because of their satisfying effect upon the appetite. Among the vegetables which he advises are green beans, spinach, cauliflower, asparagus, mushrooms, and the cabbage group. He forbids grapes, bananas, figs, dates, and nuts. Other fruits may be eaten raw or cooked, with the addition of saccharin. Bread is given preferably in the form of whole wheat bread, or diabetic bread containing albumin. Alcoholic beverages are forbidden. Other beverages should not be taken with meals. They should be restricted in amounts and taken between meals. The intervals between feedings should not be long, and a cup of tea, bouillon, or some raw fruit taken between meals may lessen the appetite for the next meals. The sensation of an empty stomach is to be avoided and this can easily be done by the use of some article of food poor in caloric value.

Von Noorden¹ distinguishes two main forms of obesity: one form as being due to overfeeding in proportion to exercise, and the other due to deficiency of thyroid function. The power of oxidation is normal in the first form, but excessive eating, or lack of exercise, or a combination of both, causes obesity. In the second form, the power of oxidation is reduced, though the amount of exercise may be relatively normal. The influence of the thyroid may be primary or secondary. In the secondary forms the deficient oxidation may be due to an inhibitory action upon the thyroid secretion by diseases of other organs, such as the pancreas, ovaries, hypophysis cerebri, suprarenals, or thymus. The division into these two main classes is made by von Noorden in order to facilitate their treatment. He treats the first class by the general principles of the usual obesity cure, which is a diet of low caloric value with an abundant supply of albumin. Exercise is a valuable adjunct and oxidation may be increased by the withdrawal of warmth. If dietetic measures fail after a fair trial, then thyroid insufficiency should be suspected. Von Noorden thinks that a careful and systematic thyroid treatment is much less taxing to the patient than the ordinary dietetic treatment, especially the "starvation cures." The patients on thyroid treatment are allowed a liberal diet, especially of proteins. He says that dietetic measures and exercise have no effect upon cases of obesity of thyroid origin except that of weakening the patient.

The *dietetic treatment of uric acid diathesis and gout* is discussed briefly by Bessau and Schmid,² and they point out the part played by the exogenous uric acid in these conditions. They include, in their article, valuable tables of the purin content of various foods.

¹ Med. Klinik, 1909, i, 1.

² Therapeut. Monats., 1910, xxiv, 116.

They found that there was no appreciable difference in the purin content of red and white meat, and but little difference in the meat of different species of animals. In general, the purin content was greater in the smaller species of animals. Fish contained approximately a higher purin content than meat. The purin content of such small fish as sardines, anchovies, and sprats was very high, consequently they consider that they, with liver, kidneys, and thymus, belong to the purin-rich foods. They also found that spinach, beans, and lentils contained a high percentage of purin bases. Some varieties of mushrooms were also found to be rich in purin bases. Bessau and Schmid state that the part played in uric acid metabolism by purin bases derived from vegetables is not definitely known, but that they are not to be disregarded as a possible source of exogenous uric acid.

Rosanoff,¹ in the treatment of *epilepsy*, obtained a reduction in the number of seizures by about 14 per cent., apparently attributable to a simple diminution of the daily allowance of the proteids and to nothing else. This diet consisted of three meals a day at the usual hours, each meal consisting of 125 grams of bread, 16 grams of butter, and 250 c.c. of milk, carefully weighed and measured. By calculation this diet contains approximately 52.2 grams of proteids, 70.3 grams of fats, and 220 grams of carbohydrates daily.

Tuthje² speaks of the good effects of the *oatmeal diet in severe cases of diabetes* with acidosis, and advances an hypothesis for its action. He suggests that the oatmeal starch may exercise a true exciting action upon the fermentative processes which possibly play a part in the metabolism of glucose in the body.

Digitalis. Hale,³ in his studies of the comparative value of digitalis and its substitutes, reaches the general conclusion that among those drugs which act as direct stimulants to the heart's action none have been found which are able to replace the preparations of digitalis purpurea.

It has long been clearly recognized, however, that digitalis medication is complicated by a number of undesirable secondary effects. These may be enumerated briefly as: Accumulative action, tendency to produce disorders of appetite and digestion, and, finally, the irritant action, which interferes with its use by the hypodermic method. These untoward effects are so marked at times as to prevent the use of the drug; they always make great caution necessary in the administration in order that dangerous toxic effects may not follow. The use of digitalis is further complicated by the fact that its therapeutic effects often do not appear until about the second day after medication is started, a drawback which makes it of practically no value in cases of acute heart failure. In certain cases the first indication that the drug has

¹ Journal of Nervous and Mental Disease, December, 1909.

² Therapie d. Gegenwart., 1910, li, 8.

³ Journal of the American Medical Association, January 1, 1910.

been absorbed is the appearance of symptoms of poisoning. These latter disagreeable features of the drug's action are usually ascribed to differences in the reaction of the patient, but probably are more often due to the variations in the potency of the drug used; the preparations being in one case much weaker, in another, much more active than the normal.

Attempts have been made from time to time to secure a digitalis preparation without these various undesirable qualities. A large number of special formulas have been used in preparing the crude drug for therapeutic use, but, unfortunately, these efforts have yielded but little success.

The so-called pure principles of digitalis have been suggested as offering a solution of the problem. Although these possess the desirable effects of the crude drug they are, however, by no means free from its undesirable secondary effects. The most potent of these, and the one that is found in greatest amounts in digitalis leaves, is the glucoside *digitoxin*. Its use in therapeutics is greatly limited on account of its excessive irritant action on the gastric mucosa, its cumulative action, and its insolubility in water which makes its administration difficult except in tablet form.

Cloetta¹ claimed to have isolated a digitoxin from digitalis leaves which was entirely devoid of these drawbacks. This new product, for sale under the trade name of *digalen*, according to Cloetta is more easily absorbed, its effect appearing within twenty-four hours, and being free from irritant qualities and its free solubility in water make it more suitable for subcutaneous injections. Hale, however, through a series of experiments on animals, refuted these claims and showed that this new product had about the same activity as digitalin and less potent than the crystalline digitoxin, and is in accord with Killian² that digalen is only a high percentage of digitalein.

Müller,³ in his experience with digalen by mouth and injections, found it unsatisfactory for subcutaneous or intramuscular injections, the injections being painful and, at times, causing considerable inflammatory reaction. He concludes that digalen differs but little in its action from other preparations of digitalis, and that it has no marked advantages over other preparations.

Mendel⁴ has attempted to find a substitute for digitalis which would not upset the stomach nor cause diarrhea, and would develop the full physiological action of the drug without showing cumulative action. He has found that the full benefit of digitalis can only be obtained from preparations containing the mixed glucosides of digitalis. Digitalin, digitoxin, and digalen do not contain the mixed glucosides, and con-

¹ Münch. med. Wochenschrift, 1904, li, 1466.

² Ibid., 1907, liv, 886, 1112.

³ Ibid., 1909, xviii, 904.

⁴ Medical Klinik, 1909, xli, 1551.

sequently Mendel has given up their use. Since the mixed glucosides are responsible for the gastro-intestinal irritation, the only sure way we have of avoiding them is to give the drug intravenously. He speaks very highly of *digitalone* which is dialized and standardized on animals. He has given digitalone to more than two hundred patients and has never seen any cumulative action nor other undesirable effects. The effect of a single dose is not as great as that of digalen or strophanthin, but these preparations are dangerous because of the tendency of passing from a physiological action of stimulation to a consequent toxic depression of the heart. He has, in the course of several years, seen a large number of patients with extreme cardiac disturbance who could not take digitalis or any of its substitutes internally, and who were kept alive for years by the intravenous injections of digitalone. Mendel has found that a single injection of digitalone was often sufficient in cases of acute cardiac failure and in distressing cardiac symptoms.

Of the cardiac irregularities produced experimentally by digitalis, the earliest to appear in most instances is an occasional omission of ventricular contractions, owing to an interruption of the stimulus between the auricles and ventricles. A somewhat late phenomenon is the production of a complete auriculoventricular dissociation which differs from ordinary heart-block in that the ventricular rate is not slow, but approaches and usually exceeds that of the auricles. Although a common result of digitalis poisoning in dogs, this condition has never been noted in man except in the case reported by Hewlett and Barringer¹ in their paper on "the effect of digitalis on ventricular rate in man." Their patient was a man, aged twenty-seven years, with chronic myocardial insufficiency, who had taken digitalis in moderate doses over a considerable length of time. He developed, on the day before his death, a remarkable condition. Tracings of the venous pulse and apex showed a regularly recurring cycle of changes apparently depending upon the interference of two systems of waves which were independent of each other and not quite synchronous. Each cycle lasted about seven seconds and included fourteen ventricular contractions. The two systems were evidently due to the auricular and ventricular contractions, and the rates were such that for thirteen auricular there were fourteen ventricular contractions. Hewlett and Barringer believe this to be the result of a cumulative action of the digitalis, and call attention to the fact that it may be difficult to ascertain when enough of the drug has been given, for at no time was there a slowing of the pulse observed. This peculiar irregularity is believed by them to be due to the action of digitalis in increasing the spontaneous ventricular rate.

Hare,² in discussing the relation of digitalis to the bundle of His, says that it is our duty not only to weigh carefully the import of the

¹ Archives International Medicine, 1910, vol. v, p. 93.

² Therapeutic Gazette, April, 1910.

tumultuous cardiac sounds, but by the use of instruments of precision to determine, if possible, whether there is delay in the transmission of the contraction impulse over the bundle. If such a delay exists, digitalis in doses large enough to cause a distinct sharp cardiac effect is probably capable of prolonging this delay and so doing harm. If, in addition to this delay, there is a jugular pulse synchronous with ventricular systole, digitalis is still more contraindicated, as it will impair the action of the left auricle and will still further distend it by stimulating the right ventricle. If given at all, the dose of digitalis must be so small as to produce a very gradual effect, one which will not consist in decreasing auricular contraction through vagal stimulation but which will gently reestablish general cardiac powers. In other words, the question of a proper dose is as important as the choice of the proper drug. Give the patient absolute rest, unload the portal system by free purgation, use venesection to relieve stasis, and give rapidly acting diffusible stimulants for a few hours until the coördination of cardiac movement is reestablished. When this is done, small doses of digitalis, arsenic, and iron may be used to restore cardiac tone.

Dry Heat. Ruggles¹ calls attention to the treatment of *phagendenic chancroid* and *chancre* by means of *hot air*. He gives a detailed history of three cases treated successfully by this method. Biological experiments have demonstrated, he says, that the thermal death point of the germ of chancroid, the Ducney bacillus, is among the lowest of the pathogenic organisms, it being destroyed in cultures by the temperature 122° F. maintained for several minutes. He believes that a large part of the benefit obtained in this treatment was due to the active hyperemia produced by the long-continued heat. That the effect of artificial hyperemia upon bacteria is not merely inhibitory but, through raising the local opsonic index, bactericidal also, has been thoroughly established by Bier and other investigators. He thinks this must be the explanation of the good effects in the author's cases, since the secondary pus cocci which predominated in both are not directly killed by the temperature employed, though their resistance may be weakened.

This method has proved very successful in the treatment of *inflamed joints*, and several observers are equally enthusiastic regarding the results in *sciatica*, *arthritis deformans*, and *rheumatism*. It is certainly of decided efficacy in the treatment of *gonorrheal arthritis*, both in respect to the relief of pain, and shortening its course. Ruggles' experience leads him to believe that these good effects are, in many cases, due not merely to the influence of heat upon the circulation and upon the removal of inflammatory exudates, but also to a certain bactericidal or inhibitory effect upon pathogenic bacteria.

Gellhorn² recommends dry heat in three classes of cases: (1) Chronic

¹ New York Medical Journal, January 22, 1910.

² American Journal of Obstetrics, 1909, vol. ix, p. 31.

exudative processes within the pelvis; (2) certain menstrual disorders, and (3) a number of postoperative conditions and complications. The principal indication for the employment of dry heat is *parametric* and *perimetric exudates*. These conditions, when the acute symptoms have passed and absorption has been but partial, may be successfully treated by dry heat, with a special apparatus which Gellhorn recommends as a result of his experience with it.

Dupont has obtained excellent results by the application of superheated air in *obstetrical tears* which suppurate and show little tendency to heal. The hot douche penetrates into all the infected crevices and destroys the putrefying tissues, while inducing a reparative hyperemia in the surrounding tissues. In one of the three cases reported in detail, the dry heat rapidly arrested the gangrenous process in the cervix, and the development of the threatening vesicovaginal fistula was checked.

Excellent results have been obtained by Ritter¹ in fourteen cases of *erysipelas* treated with hot air.

The *open air treatment of burns* is favored by St. John.² The object of the open air method of treatment is to cause as little pain as possible and to avoid interference with the natural reparative processes which nature best accomplishes in these cases. The advantage is that it does away almost entirely with extensive dressings, which are more or less painful, interfere mechanically with growth of granulation tissue, and cause destruction of the granulations themselves, by bleeding, etc. Furthermore, the danger of keeping pus and exudate back in the tissue is obviated. If the posterior portion of the body is chiefly involved, the patient is placed upon a water bed, without attempting even to clean the skin or in any other way further disturb the patient. In warm weather he can be left thus exposed to the air, and preferably the sunlight, covering only those portions of his body as are necessary. In winter, cradles are placed over the patient, and over these are spread blankets, leaving the body untouched; the face is left exposed, and the tent-like cover is so arranged as to fit snugly about the neck.

Eucalyptus. Twenty-six cases of *pertussis* were treated by Soldin³ with eucalyptus. He made use of two commercial preparations of eucalyptus leaves, *sanosin* and *sydrosin*. He found that the drug lessened the number and severity of the paroxysms in most of the cases. Three of the patients failed to receive any benefit from the treatment. Soldin found that this treatment was of special value when there was a marked bronchitis or when there were indications of a complicating bronchopneumonia. He does not believe that this method is specific, but thinks it does diminish the severity and length of the disease. He advocates its use because it can be given with perfect safety.

¹ Münch. med. Wochenschrift, May 24, 1910.

² American Journal of Surgery, July, 1910.

³ Klin. therap. Woch., 1909, xxix, 722.

Eucalyptus leaves have been advocated for a long time in the treatment of various respiratory diseases, especially *asthma* and *chronic catarrh*. A disinfectant and a sedative action have been ascribed to the ethereal oil contained in the leaves. Danielus and Sommerfield advocated the evaporization of the leaves in the treatment of *tuberculosis*, and claim that it diminishes both the cough and expectoration.

Glycerin. Basing the treatment on the theory that pernicious anemia is due to the hemolytic action of a lipid substance similar to oleic acid led Vetlesen¹ to use glycerin in the treatment of two cases of *pernicious anemia*. According to Vetlesen, glycerin forms an inert ether (triolein) when combined with oleic acid, therefore he gave the glycerin, hoping for a similar combination with the lipid substance, which is, according to this theory, the cause of pernicious anemia. He gave half an ounce of glycerin with the juice of half a lemon three times a day. One of the cases under observation showed a hemoglobin percentage of 20 and a red cell count of 900,000. Before this method of treatment was inaugurated there were also corresponding morphological changes in the red cells peculiar to this disease. After seven weeks' treatment the hemoglobin content increased to 90 per cent., and the number of red cells to 4,700,000. The patient's general condition improved greatly, having gained thirty pounds in weight while under this treatment.

Petri² reports three cases of "*anguillula intestinalis*," where glycerin was used as a vermifuge. The ordinary vermifuges entirely failed to relieve the patients of the parasite. Petri administered 25 grams of pure glycerin and the same amount in capsules, with 30 grams by the rectum two hours later. Two days later the same procedure was repeated, with a result that for the first time in two years the stools were free from the larvæ.

In one case complicated with uncinariasis, the latter was cured by the ordinary method of treatment with aspidium, but the anguillula did not seem affected by it. Petri finally succeeded in expelling the parasite by giving glycerin.

Hexamethylenamine. This most useful drug has been reviewed by me in PROGRESSIVE MEDICINE for 1908 and 1909. Its efficiency as a genito-urinary antiseptic and as a bowel antiseptic has been known for many years, but its efficient activity as an antiseptic in the fluids of the body, combined with its comparative harmlessness, has not been thoroughly recognized until recently. Crowe³ demonstrated its excretion in the bile, pancreatic juice, cerebrospinal fluid, synovial fluid, and in the saliva and milk of dogs. Its excretion in human milk has also

¹ Semaine Méd., 1910, xxx, 45.

² Therapeutische Monatshefte, Berlin, February, 1910.

³ Bulletin of the Johns Hopkins University, 1908, vol. xix; 1909, vol. xx.

been observed,¹ and Hanzlick² demonstrated its excretion in human saliva.

The elimination of hexamethylenamine by the mucosa of the middle ear was noted by Barton.³ He gives a detailed account of a case of *acute suppurative otitis media*. A patient developed an acute otitis media with a profuse purulent discharge showing microscopically the diplococcus pneumoniae. The patient was treated for five days with hot boracic acid irrigations of the external auditory canal, but without the slightest abatement of the discharge. Hexamethylenamine was administered in small divided doses, 1 gram (15 grains) in twenty-four hours; the discharge showed a marked decrease and gave a positive chemical reaction for the drug. The administration of hexamethylenamine was continued the following day. The discharge became scanty and but few bacteria were found. Two days after the first administration of the drug, the discharge had entirely ceased. Barton had reported several other cases of otitis media where hexamethylenamine was used in the treatment.

Hexamethylenamine is destined to play a very important role in the treatment and prophylaxis of *bowel infections*, and particularly in *gall-bladder disease* due to gallstones complicated with bacillus typhosus, in *enteric fever* and in *post-typhoidal states*, in *cerebrospinal infections*, in *middle-ear disease*, in *gonorrheal* and *pneumococcic arthritis*. The administration of the drug in these conditions is scientific and sound therapeutics, and it certainly seems advisable to administer this drug in addition to whatever other treatment is inaugurated. It should prove of value in pre-operative states on the biliary passages due to infections, and in mastoid diseases, since it tends to render these structures sterile and thereby prevent any postoperative complications.

The dose of hexamethylenamine varies from 0.25 to 1 gram (4 to 15 grains). The average dose of 0.5 gram ($7\frac{1}{2}$ grains) is probably efficient in most cases, the frequency of its administration being determined by the condition. It is, however, unwise to give the drug in acute nephritis except in smaller doses, since it has a slight irritating effect on the kidneys and may cause a slight hematuria or hemoglobinuria. The drug has been given in many instances over long periods of time in the above-prescribed doses, and gave no evidence of any untoward symptoms or signs. The mode of excretion of hexamethylenamine as such, or as formaldehyde, plays an important part in the estimation of its value as an antiseptic. Sollman⁴ has shown that the greatest part of hexamethylenamine is excreted unchanged in the urine, but when the urine is not voided too frequently, the retention of the urine in the bladder decomposes the drug and free formaldehyde is liberated.

¹ Bucura, Ztschrt. exper. Path. u. Therap., 1907, iv.

² Journal of the American Medical Association, June 11, 1910.

³ Ibid., March 12, 1910.

⁴ Ibid., vol. li, p. 818.

As to the formation of free formaldehyde in the cerebrospinal fluid, the pancreatic juice, the bile, saliva, milk, or blood, after the administration of hexamethylenamine internally, no data are as yet available; but the retention or stagnation of the fluids in the body after injection of hexamethylenamine would probably give time to the slow liberation of free formaldehyde, as was noted above in its excretion in the urine.

Frothingham,¹ in his experiments with hexamethylenamine on guinea-pigs, found that when the drug is given subcutaneously, either in single doses or in repeated doses, it produces necrosis of the muscle, and cellular reaction at the point of inoculation. It also causes congestion of the stomach vessels, and in some cases hemorrhage into the mucosa, with ulcer formation. Frothingham says that this work offers no proof as to what lesions in man may be the cause of symptoms occasionally produced by hexamethylenamine, but it suggests that these lesions are not organic. The most interesting points brought out are the enormous amount of hexamethylenamine a guinea-pig can receive subcutaneously without apparent injury, and the fact that hexamethylenamine is another drug to add to the list of those which may cause hemorrhage in the stomach walls of guinea-pigs.

Lactic Acid. During recent years much has been written about autotoxemia, and especially that form of this condition which is due to intestinal putrefaction. This intestinal putrefaction is caused by, or is associated with, the growth and multiplication of microorganisms. Two varieties of this putrefaction are recognized, and are distinguished as proteolytic, due to putrefaction of proteids, and saccharolytic, due to the putrefaction of sugar. Three different ways are in vogue in combating or preventing these intestinal changes: (1) The regulation of the diet so that the food ingested is thoroughly digested and completely absorbed, and consequently but little material is left for the putrefactive bacteria to work upon; (2) by the administration of drugs which inhibit or prevent the growth of these organisms; (3) the inhibition or prevention of their growth by the introduction into the alimentary canal, and encouraging the multiplication therein, of bacteria which are inimical to the putrefactive bacteria already at work.

The bacteria, up to the present, which give promise of proving most useful in preventing the development of the putrefactive bacteria in the alimentary canal are the lactic-acid-producing bacilli.

It cannot be too strongly emphasized that there are two distinct processes which may take place in the intestine: (1) A putrefaction of proteids due to the multiplication of proteolytic organisms, and (2) an abnormal fermentation of carbohydrates, from the excessive growth of saccharolytes. It is the first of these only which we can hope to influence by the use of the lactic acid bacilli, and in practice it

¹ Archives of Internal Medicine, November, 1909.

is essential that we diagnosticate the exact condition before attempting anything in the way of treatment.

The *method of distinguishing between the proteolytic and saccharolytic types of putrefaction* is not difficult and quite within the range of daily practice, depending merely upon the examination of the stools. (a) The reaction of the stools; putrefactive stools are alkaline, fermentating stools are acid, there are, of course, some exceptional circumstances in which the reaction is not clear. (b) Strasburger's fermentation apparatus; by which we can find out the kind of process to which the feces are predisposed and thus determine which process is probably taking place in the intestines. (c) Examination of the urine; intestinal putrefaction of the proteolytic type is indicated by the presence of indican in the urine; when it is of saccharolytic type, the ethereal sulphates predominate. (d) The examination of cover-glass preparation stained by Gram method and counterstained with neutral red. In healthy stools the Gram negative organisms predominate (the colon bacillus being Gram negative). In abnormal putrefaction in proportion as the aërobic bacteria are replaced by strict anaërobes, most of which are Gram positive, so the blue stained organisms are in excess. In a general way it may be said that if the stools are predominately Gram positive, lactic acid bacilli are indicated, and will probably do good. If, on the contrary, we find the majority of the bacterial flora Gram negative, the attempt to acclimatize the Bulgarian bacilli in the intestine will probably do more harm than good.

The treatment, with lactic acid bacilli, of *infantile diarrheas* due to intestinal fermentation has been undertaken by several observers. Dunn¹ believes in an etiological classification of infantile diarrheas. He sharply distinguishes between (a) bacterial infection, or infectious diarrhea, and (b) bacterial fermentation or fermental diarrhea, clinically, the former is characterized by persistent fever and the early appearance of the signs of ileocolitis, *i. e.*, mucus and blood in the discharges. The latter is characterized by the absence or brief duration of fever and by signs of excessive fermentation in the discharges, that is, a green color and foul odor, with signs of ileocolitis only after prolonged illness, if at all.

Dunn quotes Tissier,² who found that *Bacillus perfringens* is the cause of fermental diarrhea, and that the lactic acid bacillus stopped its development. He, therefore, gave such patients pure cultures of this bacillus, noting rapid transformation of their stools, subsidence of their symptoms, and gain in weight. For this same purpose Dunn employed unpasteurized buttermilk, knowing that it contained large numbers of these bacilli. The buttermilk selected was first pasteurized to kill all other organisms, then inoculated with a pure culture of lactic

¹ Journal of the American Medical Association, 1909, vol. liii, p. 5599.

² Annales de l'Institut. Pasteur, xix, No. 5.

acid bacilli, and ripened until the development of the organism had brought about the proper acidity and precipitation of the casein.

The unpasteurized buttermilk was used by Dunn in 35 cases which had resisted the usual treatment for fermental diarrhea, consisting of the administration of castor oil, or calomel, then allowing no food except boiled water for twenty-four hours, and then a weak form of modified milk. Of the 35 cases in this series, 5 were of the irritative type, and the treatment failed; 2 cases were infectious, but probably of dysenteric origin, characterized by persistent fever and bloody mucous stools. In these, also, the treatment failed. Of the remaining 28 cases, 23 were successful, 3 were partly successful, and in 2 the treatment failed. The cured cases lost their diarrhea and gained weight rapidly. All these babies had failed to improve on routine treatment, and also when fed on pasteurized buttermilk; the recovery, therefore, cannot be due to the chemical peculiarities of the food, but to the only new element added, the lactic acid bacillus. Dunn concludes that the use of living lactic acid bacilli is a harmless method of treatment and that it is an efficient agent in the treatment of intestinal fermentation. It is an additional resource in a very difficult class of cases. It certainly has a logical scientific foundation, and may in time take a high place in the scale of efficiency. A ripened milk containing living bacilli he considers the best food with which to begin feeding in cases of fermental diarrhea after the initial period of starvation.

While it has been pointed out that the multiplication of the bacteria of putrefaction and of abnormal fermentation in the intestines is accompanied, in most cases in children, by diarrhea, in adults, on the other hand, constipation is usually a common result. Gaillard¹ expresses the belief that constipation is closely associated with autointoxication, particularly that resulting from decomposition of albuminoids. The action of the bacteria which act on vegetable compounds in the form of organic acids, such as lactic and acetic acids, is antagonistic to this autointoxication.

Labbé and Uitny² report the findings in normal subjects taking lactic bacilli on a test diet for periods of from four to fifteen days. The proportion between ethereal sulphates and the nitrogen in the urine remained constant, showing that this proportion has no connection with intestinal fermentation. The findings demonstrated that the absorption of nitrogen is much reduced under the influence of lactic ferments. They are contraindicated, therefore, when it is desired to give the patient a diet rich in nitrogen.

McLoughlin,³ acting on North's⁴ suggestion of treating suppurating wounds with lactic acid bacilli, prepared a powder consisting of the

¹ Journal de Médecine de Paris, August 8, 1908.

² Presse Médicale, Paris, August 14, 1909, vol. xvii, p. 577.

³ Medical Record, December 11, 1909.

⁴ Ibid., March 23, 1909.

sterilized and dried solids of skim milk in which was incorporated a dried culture of Metchnikoff's Bulgarian bacillus, care having been exercised in the drying of the culture not to carry the temperature above 101° F. This powder was then used as an ordinary dusting powder on cases of *carcinoma*, *chancroid*, *purulent ulcers*, and *ordinary septic wounds*. The results have been very favorable. McLoughlin deems it necessary that in order to get the fullest action of lactic acid bacilli they must be applied in a medium suitable to their growth and development in the wound, and that this medium must be capable of undergoing lactic fermentation.

Mercury. The hypodermic injections of *mercury succinimide* in the treatment of *pulmonary tuberculosis*, as advocated by Wright, has been given a thorough trial by several observers.

Hartz¹ applied the treatment in twenty cases of phthisis; a variety of cases were selected in an endeavor to ascertain in which type the treatment gave the best results. The classification of the different stages of the disease is the same as the one adopted by the National Association for the Study and Prevention of Tuberculosis. The types of cases included in the series were as follows:

Incipient: Arrested or stationary	2
Incipient: Slowly progressive	2
Moderately advanced: Had improved under hospital care	2
Moderately advanced: Apparently cured	2
Moderately advanced: Stationary or arrested	6
Moderately advanced: Showing slow deterioration of general condition	1
Miliary: Bed patients, progressive	2
Advanced: Bed patients, progressive	2
Laryngeal: Moderate advancement in lungs	1

In a general way it may be said that some showed temporary improvement in their condition, but it could not be very definitely attributed to the mercury, as it differed in no way from that in the non-treated cases. Eventually, however, all the patients began to deteriorate almost in direct proportion to the number of injections that each had received.

From a careful study of the cases during the course of treatment it was observed that mercury had no specific effect upon the course of the disease, and showed no tendency toward checking the local involvement in the lungs. Four of the cases showed temporary improvement in their general condition, but it was probably due to the therapeutic action of the mercury in the associated anemia. These patients, however, afterward began to fail in health, and the deterioration was more rapid than in those who had not received the mercury. The quiescent

¹ Journal of the American Medical Association, September 10, 1910.

lesions in the lungs became active, infiltration into the healthier tissues of the lungs occurred, cough, profuse expectoration, and marked constitutional symptoms became progressively worse, thereby causing grave nutritional disorders until the patient finally succumbed to the disease. A predisposition to hemorrhage manifested itself in 3 cases, particularly in the fibroid type, and was the immediate cause of death in 2 of the patients. Salivation and pains in the bones developed in 3 of the cases and treatment had to be abandoned on this account; 2 of the patients who received thirty injections each, had a positive history of a syphilitic infection during their earlier life, and the mercurial injections in these 2 patients were borne with greater impunity; one of the patients was alive fourteen months after the last injection, with slight changes in his general condition, but occasionally was confined to bed on account of hemoptysis, or for a transient pleuritic affection. The only other patient who is alive of the group that received six or more injections, is now suffering from a pyopneumothorax and has had several aspirations performed. For the past two months this patient lost rapidly in weight, is very weak, and death with her is only a matter of weeks.

One year after the treatment had been discontinued the following results were noted in the patients who had received the mercury injections. Of the 14 patients who received six or more injections, 12 died from two weeks to six months after the last injection. Of the remaining 2 of the 14 patients who are alive, 1 has had repeated hemorrhages, and is occasionally confined to bed, the other has had several aspirations because of pyopneumothorax and is rapidly failing in health. This enormous percentage of deaths, namely, 85.7 per cent., among those patients who received six or more injections, can be attributed only to the use of mercury, simply from the fact that the expectation of life in many of the cases chosen was very favorable indeed. In fact, on account of the age of the patients and the chronic arrested type of the disease, they were the kind of patients who live long and have a favorable prognosis. Further, it may be noted that of the 6 patients who received four injections or less, 5 are alive and only 1 died, giving a mortality of only 16.6 per cent., as compared with the mortality of 85.7 per cent. of those cases who received a greater number of injections. Of the patients who had received the fewest injections, 83.4 per cent. are alive, while only 14.3 per cent. are alive of those who had received a greater number of injections.

To sum up, of the 14 patients who received six or more injections, 12, or 85.7 per cent., died, and 2, or 14.3 per cent., lived. Of those who received four injections or less, 1, or 16.6 per cent., died, and 5, or 83.4 per cent., lived.

From the above results the only deduction that can be drawn, he says, is that mercury, as recommended, has utterly failed as a specific agent

in the treatment of pulmonary tuberculosis, and is positively injurious and detrimental to one afflicted with tuberculosis.

Carrington,¹ in his description of the United States Marine Hospital Sanatorium for Tuberculosis at Fort Stanton, N. M., tells us that they had recently attempted the use of mercury succinimide by deep muscular injections. They used this treatment on 25 or 30 patients during a period of two months, but have been unable to secure any results even remotely approaching those published by Surgeon Wright, of the navy.

Beggs² does not consider mercury a specific for pulmonary tuberculosis. In most cases he believes the improvement is subjective, with very slow improvement in the physical signs.

Placak's³ experience with mercury succinimide has been limited to 20 cases, yet this number, he says, has been sufficient to convince him that mercury will fall by the wayside as many so-called specifics in tuberculosis have done in times gone by. Of the 17 cases that he reported, 3 cases giving a positive history of syphilis showed a marked improvement, 1 patient in whom syphilis was suspected showed a marked improvement, 3 non-syphilitic cases showed slight improvement, 5 cases died, the remainder became progressively worse. Placak summarizes his observations by saying:

1. Mercurial preparations given in pulmonary tuberculosis are far from being specific in their action.

2. Injections of the succinimide produce pain which is at times quite severe.

3. The best results are obtained by the administration of mercury in those cases of pulmonary tuberculosis in which syphilis seems to have some bearing upon its etiology.

4. Large doses of mercurial preparations are harmful in pulmonary tuberculosis in that they cause a breaking down of the tuberculous area.

5. It is inadvisable to give potassium iodide as part of the treatment because it may produce a reaction similar to that of an overdose of tuberculin.

6. Intramuscular injections of the succinimide sometimes produce indurations at the site of injections which persist for many months.

Among the 327 cases of *syphilis* that were treated by Bernart⁴ with *intravenous injections of mercuric chloride*, were many syphilo-tuberculous patients; in all, 9446 injections were administered. Bernart makes the following observations on the syphilo-tuberculous patients:

1. The control of the active syphilis in many of the tuberculous patients seemed for the time to benefit the tuberculosis also.

¹ New York Medical Journal, February 27, 1909.

² Medical Record, August 20, 1910.

³ Cleveland Medical Journal, March, 1910.

⁴ New York Medical Journal, June 27, 1908.

2. That in patients with pulmonary tuberculosis, after the first control of syphilis, and if the treatment was continuously pushed, a few months would show a gradual aggravation of the tuberculosis.

3. That the genito-urinary tuberculous patients, outside of the benefits to their syphilis, showed no improvement in their tuberculosis.

4. That 2 patients with tuberculous eye trouble were benefited, 1 markedly so, and the other but moderately so. This is not surprising, as the intravenous injections of mercuric chloride exert a decided and beneficial influence over infections and ulcerations of the eye.

5. That the patients with pulmonary tuberculosis, evidently suffering from absorption of septic materials, probably due to a secondary germ infection, were decidedly benefited up to a certain point, after which, if the mercurial treatment were continued, their retrogression was rapid.

Bernart, in commenting on the editorial suggestion¹ of sending tuberculous patients to the various spas, such as Hot Springs, Arkansas, for the reason that they can probably tolerate larger doses of mercury there than elsewhere, has this to say: "I can only say that after five years of practice at that same resort, I became imbued with the general impression in vogue, and this impression undoubtedly emanated from experience, that, so far as tuberculosis is concerned, syphilo-tuberculous patients do not do well under the treatment at that place. This impression may not be due to the mercury but to the overdosing with the iodides, a habit nearly universally prevalent at the Springs.

How then can we explain the results which were obtained by Wright? Possibly from the fact that his patients (mostly seafaring men) may have had syphilis. Again, his patients were getting all of the benefits of fresh air, feeding, and the regular routine of a sanatorium. The results obtained from the general routine are many times marvellous, even in advanced cases, and one may become deceived at times, ascribing the improvement to some remedy when in reality it is the general routine which causes improvement.

The *intravenous bichloride treatment of puerperal infection* is advocated by Barsony.² He has been using this method during the last six years, after nine years of tentative administration. In well-established puerperal infection he injects 0.005 gram of the bichloride, and if the temperature keeps up, he repeats the injection the same day. The injections are suspended at the slightest sign of intoxication and resumed, with a smaller dose, when these symptoms have subsided. He discards all local treatment except weak antiseptic vaginal douches, never using the bichloride for this purpose for fear of cumulative action. The results, in general, have been so satisfactory that he has decided in the future to make a prophylactic injection of 2 mg. in all parturient patients,

¹ New York Medical Journal, May 22, 1908.

² Obstétrique, Paris, November 11, 1909.

and inject 3 mg. as a routine procedure before major gynecological or obstetrical operations. In a total of 2736 obstetrical patients only 2 women succumbed to puerperal infection, one having a preëxisting pyosalpinx, the other a felon.

Wallhauser¹ used *bichloride of mercury* applications in the treatment of *idiopathic multiple hemorrhagic sarcoma* with complete disappearance of the growth after several months' treatment.

Scharff² has obtained good results in the *local mercurial injections* in treatment of *varicose veins*. The treatment is based on the current observation that intravenous injections are liable to induce local thrombosis, an untoward effect when the injection is made for other purposes, but an ideal result when the aim is to render smaller the lumen of a varicose vein. The injection is directed against the endothelium of a vein instead of the middle of the blood stream, a complete and lasting occlusion of the vein being readily accomplished. The irritation caused by the injection produces a hyperplasia of connective-tissue cells which encroach on the lumen of the vessel and ultimately obliterate it.

Menthol. Menthol has been used successfully by Davies³ in the treatment of *screw-worm* from the fly "*compso myia macellaria*." The infection, he says, is invariably complicated by the preëxistence of an atrophic rhinitis or an ulcerated condition, permitting the larva—screw-worm—to burrow and thus escape the action of most solutions used to dislodge and destroy it. Chloroform sprays and inhalations destroy the worms that are hatched and lying in the open, but it does not penetrate sufficiently, neither is its action prolonged enough to destroy the worm after it has burrowed into the diseased tissues from an atrophic rhinitis, or the egg while it is being hatched. The successful eradication of the hookworm by the use of menthol led Davies to try the drug in the treatment of screw-worm.

Preceding the menthol, peroxide of hydrogen was sprayed into the nose two or three times, the patient blowing his nose freely between the applications. Then a 20 per cent. solution of menthol was sprayed into the nostrils very thoroughly under twenty pounds' pressure. Usually within half an hour numbers of the worms were expelled and in three days, after spraying twice daily, they ceased altogether and showed no return. Weak solutions were first used but proved useless. The nasal tissue that is in condition to permit the growth of this parasite has lost all sense of pain, thus permitting the use of strong solutions.

A few drops on a handkerchief of a mixture of equal parts of menthol and chloroform to be inhaled through the nostril as a treatment of *coryza*, was suggested in *Les Nouveaux Remèdes* of March 24, 1910. It is stated that such an inhalation causes the sensation of obstruction

¹ Journal of the American Medical Association, November 13, 1909.

² Berliner klin. Wochenschrift, March 21, 1910.

³ Journal of the American Medical Association, January 1, 1910.

in the nose to immediately disappear. A few drops may also be placed in a cup of hot water and the vapor inhaled and a little brandy may be added to improve the odor. I would suggest that the patient be cautioned not to pour too much of the mixture on the handkerchief because of the presence of chloroform.

Paraffin. As a result of considerable experience with paraffin injections in the treatment of *ozena*, Botey¹ comes to the conclusion that this is really the best treatment in vogue today for the treatment of this affection. His results have been 50 per cent. of cures, 35 per cent. of great amelioration, and 15 per cent. of slight amelioration.

He states that a preliminary injection of water beneath the mucous membrane facilitates the subsequent injection of the paraffin. His cures of *ozena* or amelioration continue intact for many years, but in contrary cases he had to repeat the injections to reproduce the results at first achieved.

Leroux² combines the advantage and avoids the perils of the hot and cold methods of injecting paraffin in treatment of *ozena*. This he accomplishes by injecting the paraffin cold, and several days later he applies a jet of superheated air to the spot under the influence of which the paraffin softens as if it had just been injected hot, penetrates into the crevices and spreads out in a more even layer. At the same time, the hyperemia thus induced stimulates the secretions and aids in the cure of the *ozena*. He uses paraffin with a melting point of 45° C. and injects it in the inferior turbinate and the upper part of the septum, aiming to retain, as far as possible, the natural shape and size of the passages and facilitate the flow of air through them. It is important, he says, to commence at the remotest part and to allow time for the lesion to heal before making another injection.

Normal Saline Solution. The good results obtained by surgeons in the treatment of *peritonitis* and other abdominal inflammations, and in grave postoperative conditions, by the Murphy method of continuous enteroclysis, led Riesman³ to use this method in the treatment of *enteric fever*. It seemed rational, he says, to suppose that the constant instillation of salt solution into the bowel would better accomplish the result aimed at by the administration of water, namely, the filling of the blood-vessels, and increased excretion of poisons. In a series of ten cases of enteric fever, several of them of great severity, this method of continuous saline instillation was used; all of the patients recovered. Riesman concludes, from this limited experience, that this method of treatment does two things: (1) It increases the flow of urine; (2) it lessens the nervous symptoms. He is also inclined to attribute the recovery of several desperate cases to this method of treatment.

¹ *Annales des maladies de l'oreille, du larynx*, November, 1909.

² *Presse Médicale*, Paris, May 7, 1910.

³ *Journal of the American Medical Association*, January 20, 1910.

Wideroe¹ has found that large subcutaneous injections of salt solution induces organic changes in rabbits. Sufficiently large injections will after a time destroy the animal.

The postmortem examinations revealed dilated and flabby hearts in which subendocardial and muscular hemorrhages were to be seen, together with minute yellow endocardial striae. Other organs showed capillary hyperemia and parenchymatous degeneration. In comparison, a man weighing 63 kilos (143 pounds) should receive daily in this manner about 5 liters of solution in order to produce a fatal result. These results are noteworthy because it has been generally accepted that the injection of physiological salt solution is not provocative of any harmful effect.

Opium. Smith,² in discussing this topic, says, that, for the relief of pain, opium and morphine are no doubt still resorted to, but even in this capacity, their claims are often set aside in favor of antipyrin, aspirin, and other recent analgesics. Unless pain be actually present, opium is now but rarely prescribed. It is often forgotten, says Smith, that opium has stimulating as well as sedative properties, and that as a general stimulant to the nerves, the brain, and all the organs of life, its value, even for this quality alone, entitles it to a high place in the esteem of the practical physician. Opium and morphine are not quite the same in this respect. Of the two, it is the former in which this quality is most active.

The stimulating effect is best brought out by the use of small doses given at convenient intervals, for in a full dose the sedative influence of the drug is so decided that any primary stimulating effect passes off too quickly to be noticeable. This stimulating action is well seen in cases of *indolent ulcers of the skin and mucous membrane*. Such sores which had resisted previous treatment will be found to show a surprising improvement after only a few doses of the remedy. The pale, unhealthy looking surface becomes red and is soon covered with closely set granulations, while its secretion changes from a thin serous fluid to healthy looking pus. This invigorating influence can be turned to account in the case of *obstinate sores* occurring in cachectic children. The *ulcerating stomatitis*, which is so common among the ill fed and badly nourished children of the very poor, often shows little disposition to heal even when treatment is reinforced by a generous diet and healthy surroundings. When repair is thus at a standstill, a few drops (2 to 5) of laudanum, given twice a day, quickly induce a welcome change in the local condition and start an improvement which goes on smoothly to a cure. Opium exerts its influence through the nervous system by which it gives energy to the capillary circulation, and affects, to some extent, every organ of the body. There can be no doubt that

¹ Berliner klin. Wochenschrift, July 4, 1910.

² British Medical Journal, December 4, 1909.

the circulation is stimulated by the remedy. The feet become warmer, and the resistance of the body to the depressing influence of cold is very appreciably enhanced. This primary effect of the drug as a stimulant of the nervous system, is a quality the value which must not be forgotten.

The nervous trepidation called "*stage fright*," may be forestalled and disarmed by a small dose, five or six drops of laudanum taken half an hour or so before the trial is to begin. Again, the *nervous trembling* and *depression* which may be induced by shock, and are apt to follow a surgical operation, are amenable to the same influence. The above dose, repeated if necessary several times at intervals of half an hour, is usually followed by tranquillity and sleep. The same treatment will go far to relieve the *distress of dying persons*. Under the influence of a few drops of the tincture the painful uneasiness abates and is succeeded by a period of restful calm which may be maintained by judicious repetitions of the remedy until the close. Again, the profound *mental depression* which sometimes afflicts elderly people, making their lives a burden to themselves and to their relatives, may be alleviated by the same means. In this, as in the preceding cases, the drug acts as a stimulant and something more, it quiets the nervous irritability, and gives a welcome spur to jaded nerves. Children, who have been treated surgically for empyema and wear a drainage tube, often suffer much uneasiness while the drainage process is going on. Under this treatment their restlessness is calmed and they are enabled to bear the continued presence of the tube without showing any sign of discomfort. In all forms of illness in which the nervous system is irritable and perturbed, the same treatment will be found of service.

From experiments performed by Reynolds,¹ he concludes that morphine exerts a marked influence on the leukocytes. Not only does it check diapedesis, but phagocytosis is diminished in a marked degree. The growth of bacteria, on the other hand, is not appreciably affected. What bearing has this on the practice of medicine and surgery? It is probable that in most surgical operations a certain number of pathogenic organisms gain entrance to the wound, however carefully asepsis be observed. The further history of the case turns on this point. Will the phagocytes be able to destroy these bacteria before the latter have multiplied sufficiently to gain the upper hand? If morphine temporarily paralyzes the activity of the phagocytes, and if this drug be given, time is lost during which the bacteria multiply. When the narcosis passes off, the phagocytes may be unable to destroy the bacteria on account of their number and the paralyzing effect of the toxins produced by them; in fact, by giving the morphine the chances of sepsis have been increased.

Uyeno² reports upon the studies he has made on animals to determine the effect of opium and physostigmine upon intestinal sutures. Dogs

¹ Lancet, London, February 26, 1910.

² Beiträge zur Klinischen Chirurgie., Bd. 65, Heft 1.

were used as controls; to 8, opium was given in doses of 0.3 gram *per anum* daily for two to three weeks, and to 11, physostigmine salicylate was administered 0.002 gram hypodermically each day for five to fourteen days. The conclusions that Uyeno reaches are that the paralysis of the intestine by means of opium, and the stimulation of peristalsis by physostigmine, have great influence upon intestinal suture; that opium favors the development of connective tissue at the site of suture, and physostigmine, interferes with the development of connective tissue. The amitotic division of the intestinal epithelium showed important differences, being somewhat hindered by opium and favored by physostigmine. Neither drug exerted any noteworthy effect so far as adhesions were concerned.

Permanganate. Stephens¹ has pointed out the fact that in plumbism the origin of the red line on the gums is due to the deposit of lead, in the form of the sulphide, on a preëxisting red line caused by irritating particles in the atmosphere in which the men work. This red line is undoubtedly inflammatory in origin as shown by the enlarged and engorged papillæ on the edge of the gum, and it is an inflammatory line that occurs on the anterior or upper end of the alimentary tract. Five cases are reported by him in which he treated plumbism by the internal administration of permanganate. The drug should be given in all cases of the nature indicated in capsular or palatinoid form, as it has a tendency to nauseate the patient. *Calcium permanganate* being of value in gastritis, acts therefore, in the nature of a preventive and it may be well to order its systematic use in all lead workers.

Phenolphthalein. The action, mode of administration, and dosage of phenolphthalein, were discussed in PROGRESSIVE MEDICINE, December, 1909. Since then several articles have appeared on the subject.

In April, 1908, Abel and Rowntree² started an investigation of the phthalein group with particular reference to the excretion, the absorption, and the purgative action of different members of this family, and also as to the effect of substitution of different parts of the phthalein radicle on the pharmacological action of the drug. It was proved that olive oil, when heated, would dissolve phenolphthalein and many of its derivatives, and that this oil preparation possessed some value as a purgative when injected beneath the skin of dogs. But it was soon observed that more prolonged purgative action was obtained when phenoltetrachlorphthalein was employed than when any other phthalein at their command was used.

Rowntree³ reports his results with the subcutaneous administration of *phenoltetrachlorphthalein*. A table is presented showing its effect when 0.4 gram (20 c.c. of an oil preparation) is given hypodermically

¹ British Medical Journal, May 7, 14, 1910.

² Journal of Pharmacology and Experimental Therapeutics, 1909, vol. i, p. 231.

³ Johns Hopkins Hospital Bulletin, September, 1909.

to patients suffering from *chronic constipation*. Ten out of the twenty-five patients, after receiving one injection of this oil preparation, together with instructions as to diet, hygiene, and habit, have had no return of constipation, although at least two months, and in some instances as many as six months, have elapsed since its administration. Rowntree gives the following disadvantages of the general adoption of phenoltetrachlorphthalein as a subcutaneous purgative:

1. The insolubility of the drug in water.
2. The slight degree of its solubility in oil, necessitating a large volume for injection.
3. The long time that elapses before the onset of purgation (eighteen to twenty-four hours).
4. The mild character of its action, which is laxative rather than purgative.

Its redeeming features are:

1. The prolonged nature of its action.
2. The absence of crampy pain and colic throughout the period of its action.
3. Its non-irritant effect locally.
4. The constancy, at least in the cases so far studied, with which it has produced its result.
5. The non-toxicity of the drug:

Rowntree says that it may prove of value:

1. In coma.
2. In marked gastro-intestinal irritability when nothing can be given by mouth.
3. Among the insane, who often refuse to swallow medicine and who fight against enemata.
4. In chronic constipation, together with hygienic, dietetic, and psychical treatment.

It is worthy of trial in the field of abdominal surgery where its introduction beneath the skin can be accomplished during the anesthesia without any pain whatever, and where its mild, prolonged, laxative effect continuing for from four to six days, may possibly entirely dispense with the necessity of administering any purgative by mouth during the first week subsequent to the operation.

Physostigmine. Abbot,¹ with the object of calling attention to the properties of this valuable agent, presents a résumé of its literature. Its qualities are so distinct and so important, he says, that it would be widely employed were these better known.

Physostigmine when administered in small doses—gr. $\frac{1}{100}$ or less to an adult—exerts a preliminary stimulant action, causing muscular twitching and increasing the irritability and force of the muscular fibers. The pulse is slowed and vascular tension raised, respiration accelerated.

¹ American Medicine, August, 1910.

The most decided effect is manifested on the musculature of the stomach, intestines, bladder, ureters, and bronchi, all of which are stimulated powerfully. The tears, saliva, perspiration, mucus, and pancreatic juice are increased. The pupil is contracted but the eye accommodated for near vision.

Physostigmine commences to display an evident action within five minutes, and by that time may be detected in the urine by which it is mainly eliminated. The maximum of action occurs in thirty minutes and subsides within an hour unless sustained by repeated doses.

In the treatment of the *morphine habit*, Waugh has obtained decided benefit from physostigmine in cases where the pupil is dilated after the morphine has been stopped, but only then. The alkaloid so completely replaces morphine then that the patient cannot detect the substitution. Yet this effect can be secured only from doses of not above gr. $\frac{1}{100}$ twice each twenty-four hours and the relief does not endure more than an hour after each dose. It affords an interval of perfect peace then.

It is the best remedy for *flatulence* due to intestinal paresis, and for *intestinal torpor*. It has recently been employed to clean the bowels before and after operations in the abdominal cavity with excellent results.

Sagerson reports its use in two cases of *fecal vomiting*; in one, it acted well, but the patient was too far gone for recovery; in the other, "the change was wonderful," and recovery ensued, which was attributed mainly to this remedy. Maschka cured a case of *diarrhea with flatulence* due to intestinal catarrh. With atropine to combat intestinal inhibition and strychnine to incite the nervous centres, physostigmine is a valuable remedy for intestinal torpor, and if not misused in too large doses plays an important part in curing this condition and the many ills dependent thereon. In this combination, Shoemaker finds it useful for *digestive troubles* of women at the change of life, and in *dilatation of the stomach*. In *bronchitis*, *pulmonary congestion*, and *pneumonia*, he found physostigmine useful by lowering the excitability of the vagus and the activity of the heart and respiration. Its tonic action on the bronchial musculature renders it of value in some cases of *asthma* and *emphysema*.

Shoemaker denies its deleterious action in *tetanus*, and says more than half the cases recover under it. It should be pushed to full effect. In *chorea*, *epilepsy*, and *progressive paralysis*, great improvement has followed its use. It has been applied successfully in *infantile convulsions* after chloroform had failed; and in *tic*, *twitching of the orbicularis*, *writer's cramp*, and *obstinate hiccough*. Ringer and Murrell reported temporary improvement or arrested progress of *paraplegia* attributed to myelitis. They also found improvement follow its use in *locomotor ataxia*. Murrell succeeded with it in controlling the *night sweats of*

phthisis. De Giovanni combined it with ergotin for *renal hemorrhages*, with benefit.

Abbot concludes by saying: Since physostigmine is a remedy that gets to work so speedily and is so quickly eliminated, it is especially one well suited for the intensive method of dosage, a minute dose being administered every ten to thirty minutes until the exact desired effect has been secured. It partakes of the safety of veratrine, aconitine, gelseminine, and pilocarpine in that it cannot accumulate.

Pituitary Extract. The usefulness of pituitary extract in *shock* and its analogous action to adrenalin on the blood pressure, but with the distinct advantage of being more prolonged in its action has been observed by several investigators.

Wray's¹ experience with the drug has given him very satisfactory results. In three cases he injected 1 c.c. of a 20 per cent. solution of the posterior lobe of the pituitary body intramuscularly into the patient's arm before the patient had fully recovered from the anesthetic. An immediate effect was noted. The imperceptible pulse became large and bounding, the action continuing from twelve to sixteen hours and then gradually passing off. The pulse increased in expansion and was distinctly slowed and became regular, where shortly before the injection marked irregularity prevailed. The drug, Wray thinks, affects the heart as well as the bloodvessels. The injection was given in conjunction with enteroclysis of normal saline solution.

Bell,² in discussing the subject, is inclined to believe that in the pituitary body we probably have found a reliable agent for the treatment of *paresis of the bowel*, being a more useful agent than eserine has proved to be in these conditions. It should also find its usefulness in the very serious *postoperative acute gastric distention*, which, in most cases, hitherto has proved fatal. The author emphasizes the prolonged action of the extract on unstripped muscle fibers, and calls attention to the special action on the heart and kidneys. After a short initial increase in the frequency, it slows the heart and causes more powerful contractions; this effect is maintained while the patient is under the influence of atropine, while in similar circumstances adrenalin causes an acceleration. Furthermore, pituitary extract shows a marked diuretic effect, while adrenalin causes a marked diminution in the urinary secretion. Bell further believes that this drug should prove of value to rhinologists, laryngologists, and oculists in producing local anemia of a more prolonged duration than is possible with adrenalin.

The chief action of infundibular extract is in all probability peripheral, but it is quite possible that it has some action on the "pressor centres" since it has proved of such value in the exhausting or parietic conditions of these controlling centres.

¹ British Medical Journal, December 18, 1909.

² Ibid., December 4, 1909.

Beck and O'Malley¹ carried out a series of experiments with reference to the effect of pituitary extract on the pulse and blood pressure. Observations of the pulse and blood pressure were always made before each experiment, and those cases which were easily disturbed through psychical influences were eliminated. The rise in blood pressure varied from 8 to 38 mm., while the pulse rate fell from four to seventeen beats per minute. No untoward effects were noted in any of the cases in which larger or repeated doses were administered. They found that the inhibitory influence upon the pulse was more lasting than the influence upon the blood pressure.

Quinine. *Quinine and urea hydrochloride* has been successfully used as a local anesthetic by Brewster, Rogers, and Hertzler.² They state that any operation ordinarily done with cocaine can be done with quinine. The technique of its use is the same, and, as in the use of cocaine, only those tissues known to be sensitive should be injected. The anesthesia in the 1 per cent. and $\frac{1}{2}$ per cent. solutions lasts from four to five days. Disturbances in skin union sometimes occurred, making the wound slower to heal than when cocaine was used. There was marked induration and thickening in some cases, and Hertzler undertook to determine the cause and found that, instead of being cellular, it was due to a purely fibrinous exudate. To what extent this fibrinous exudate is subsequently converted into fibrous tissue is not definitely determined, but apparently nearly all is absorbed. With the $\frac{1}{4}$ per cent. solution this induration did not occur to any notable degree, and this seems to be, therefore, the strength advisable to use in operations where speedy primary union of the skin is desirable and where anesthesia, lasting more than several hours, is desired. In regions where primary union is not necessary, particularly in tissue, the seat of inflammatory reaction, the stronger solutions are more satisfactory. In the opening of *abscesses*, for instance, and *operations for anal fistula, hemorrhoids*, etc., the stronger solutions are the ones of choice. In *tonsillectomy*, and in *turbinectomy*, and in regions in which operation is attended by hemorrhage, the stronger solutions are recommended because of the hemostatic effect exercised by the fibrinous exudate. The coagulum occurs about, and not in, the vessels, and their occlusion, therefore, results from pressure without. The effect lasts from seven to fourteen days, and thus allowing healing by granulation to become well advanced. This is in marked contrast to the ephemeral influence of cocaine and adrenalin, which act only by causing a contraction of the muscular walls of the bloodvessels. The authors have performed the following operations under quinine anesthesia: *Drainage of the gall-bladder, drainage of appendiceal abscesses, exploratory laparotomies*,

¹ American Medicine, October, 1909.

² Journal of the American Medical Association, October 23, 1909.

hernias, castration, varicocele, and hydrocele operations, etc., and the removal of all sorts of tumors ordinarily undertaken under cocaine.

In *operations about the anus* they particularly emphasize the value of this anesthetic. In both *fistulas* and *hemorrhoids*, and any of the radical operations, they assert, can be performed with the same thoroughness as under a general anesthetic. The advantage consists in that the duration of the anesthetic is from seven to ten days, which does away entirely with the after pain ordinarily attending these operations.

For local applications to the mucous membranes, the strength must be from 10 to 20 per cent., as first suggested by Thibault.¹

The *advantages* claimed by the authors of this anesthetic over cocaine and its congeners are as follows:

1. Its absolute safety. One of the writers (Brewster) has used as much as 100 grains intravenously in six hours in pernicious malaria with the recovery of the patient.

2. The duration of the anesthesia. The after pains in certain wounds is avoided.

3. The hemostatic effect.

Strone² has treated *epithelioma* with local applications of quinine. The drug was stirred with water to a paste, and applied with a cotton wad in a number of cases in which operation was refused. In every instance the quinine had a caustic action on the growth, eating it out until the ulceration was three times or more the size and depth as at first. He renewed the quinine every second day for four times. The lesion then began to heal over with a simple iodoform dressing, and by the twentieth day had entirely healed. Strone believes that quinine is also useful as a palliative treatment of *inoperable uterine cancer*. Quinine also serves to distinguish cancer from ordinary erosions, with the latter there is none of the destructive action as observed with cancer; it, therefore, should be used as a preliminary to radical operations, as it aids in differentiating the two processes.

Rigollet³ believes that the cases of tetanus reported as resulting from an injection of quinine were due to faults in asepsis. He investigated the original records of the tetanus cases, and found that in most instances there had been either an abscess following the injection or local necrosis of the skin. From this he concludes that there was in each case some fault of technique resulting in the introduction of the bacteria of suppuration, and presumably of the tetanus bacilli also. As the hypodermic method of administering the quinine is of great benefit in severe cases of quartan fever, it becomes a matter of importance to ascertain definitely whether quinine predisposes to tetanus infection as was suggested by Vincent.

¹ Journal of the Arkansas Medical Society, September, 1907.

² Medizinische Klinik, Berlin, November 28, 1909, p. 1803.

³ La Presse Médicale, November 6, 1909.

Gabbi¹ compares the number of cases of *malaria* last year with those in previous years in certain localities in which malaria is endemic. In these districts, the extermination of the anopheles is practically impossible on account of the many irrigating canals, ponds, etc. Preventive quinine administration, and quinine treatment of the inhabitants suffering with malaria, has resulted in a marked reduction in the number of cases in these hotbeds of malaria. Gabbi states that it is a difficult matter to convince the peasants of the advantages of taking quinine when they are not sick. He remarks that experience has repeatedly demonstrated that quinine prophylaxis must be kept up like the mercurial treatment of syphilis.

Bergratti² used quinine in four old and previously rebellious cases of *pemphigus*, at Neisser's clinic at Breslau. The treatment proved itself to be very effectual. He gave 1.5 gram (22.5 grains) in fractional doses of the quinine and then reduced the dose for a few days.

French,³ in his special work on venereal diseases in the army, has used quinine extensively in the treatment of *syphilis*. The author's attention was chiefly directed to this drug in India where cases of syphilitic fever were not infrequently sent into the hospital as ague, or *vice versa*, or the two diseases co-existed. He states that quinine in dilute acid solutions is often most valuable as a precedent to, or follower of, the first mercurial course in cachectic cases. Whether it exerts a specific action on the spirocheta of syphilis, as on the malarial parasite, is uncertain, but he thinks that it should be invariably given if there is an associated malarial history or syphilitic fever. As early syphilis is associated with a loss in numbers of the red blood corpuscles and in the amount of hemoglobin in those cells, quite possibly the chief action of quinine may be in overcoming this degenerative action, and thus assisting the blood to better deal with the inroads of the virus in the early and more remediable phases of the disease, by increasing the phagocytic power, or by the formation of antibodies. Further, any drug which tends to reduce the number of spirochetæ in the blood in the early stages will consequently lessen the amount of toxin which can later injure the central nervous system and cord.

Scopolamine and Morphine. To one who studies medical literature, the large number of articles on anesthesia seem to indicate that the ideal anesthetic has not been discovered or the ideal method of administration has not been invented. Within the past few years scopolamine and morphine, as a preliminary to general anesthesia and their usefulness as a narcotic in labor, have been the subject of many important papers.

The method of producing surgical anesthesia by the injection of scopolamine and morphine was introduced by Schneiderlein in 1900,

¹ Policlinico, Rome, January 6, 1910.

² Münch. medicin. Wochenschrift, January 4, 1910.

³ British Medical Journal, July 10, 1909.

and Steinbüchel used this method to annul the pain of labor in 1902. On account of its heavy death roll—43 deaths in 6000 cases (Avarffy)—as well as for a host of other reasons, this method is as yet on trial in surgery and there is a great difference of opinion as to its value in obstetrics. Recent contributions on the subject are numerous, and it has also been discussed in several editorials,¹ but as yet it still remains an unsettled question.

Scopolamine, or hyoscyne, belongs in the atropine series and, to a certain extent, it resembles atropine in its peripheral action, but unlike atropine, sometimes it causes drowsiness and eventually an overpowering desire to sleep. The sleep, which may last from five to eight hours, is followed by drowsiness. Morphine and scopolamine are strongly synergistic in producing narcosis, but the claims of Schneiderlein and other early advocates of the use of these as to their antagonistic side action do not seem to be borne out by a more careful observation of their physiological action, and by clinical experience. *In obstetrics*, the usual initial dose is 0.0003 gram (about $\frac{1}{1000}$ grain) of the hydrobromide of scopolamine with 0.01 gram (about $\frac{1}{6}$ grain) of morphine injected subcutaneously. In favorable cases this causes the patient to sleep between the pains, and while the woman may be aroused by the pains and suffer more or less for the time being, yet there is no recollection of the pains afterward. If necessary to induce this state, the scopolamine may be repeated once or twice, but not the morphine, the indications being furnished by the mental condition of the patient who should be maintained in such a state of amnesia that she does not remember what happened thirty or thirty-five minutes before.

Among the advocates may be mentioned Krönig, from whose clinic Gauss has reported 1000 cases, and an additional 700 cases have been included in this series since the first report. Krönig contradicts the statements of others that these drugs increase the tendency to atonic hemorrhages, and does not believe that organic heart trouble is any contraindication to their use, but he intimates that the length of labor may be slightly increased. He also states that about 10 per cent. of children of mothers treated in this manner were born slightly apneic, but, on the other hand, he asserts that the mortality of children in labor is diminished by this plan.

Buist, an English observer, in a paper read before the British Medical Association in 1908, spoke highly of this method of relieving pain in parturition. He believes that both the patient and the physician are saved much suffering and anxiety. Beruti had satisfactory results in 600 cases with this treatment. Avarffy,² on the other hand, condemns this practice without reserve and strongly emphasizes the drawbacks of this method, namely, the dangers to the child from

¹ Journal of the American Medical Association, February 5, 1910.

² Gynäk. Rundschau., 1909, iii, 338.

asphyxia, and the occasional but non-predictable untoward effects in rendering the patient violent and unruly. In support of his conclusions, Avarffy cites a number of statistical observations on cases studied by himself, and others, to the effect that amnesia was noted in only two-thirds of the cases, that labor pains seemed weakened in about one-third, that abdominal straining was weakened in about one-fourth. In 1607 cases from five different clinics, he states, 8.89 per cent. of asphyxia of the children were noted; aligopnea was present in 17.6 per cent., and there were 0.49 per cent. of fatalities among the children. The method presumably increases the dangers to the child, and in view of this fact this plan of treatment in labor remains as yet to be positively demonstrated as a safe means of controlling the pain of labor.

Collins¹ reports favorably on *scopolamine and morphine as a preliminary to general anesthesia*. His studies are based on an experience of 1100 cases. He summarizes his experience by saying that: Scopolamine and morphine, as a preliminary to general anesthesia, is a rational procedure, adding greatly to the comfort of the patient by relieving him of all nervous apprehension prior to the administration of the general anesthetic; by permitting him to sleep some hours after the operation is completed; by greatly decreasing the postoperative vomiting, and mitigating the dangers of the general anesthetic by lessening the amount necessary to produce the desired effect; and by checking the secretion of mucus in the throat.

Padro² records his experience in 770 surgical cases in which a single injection of scopolamine and morphine was employed prior to the use of a general anesthetic. The results that Padro obtained were in his opinion favorable, in that the beginning of the narcosis was marked by the absence of irritation and excitement, the patient, as a rule, falling into a sleeping condition or one of peacefulness when the inhalation was begun, and then passing quickly into complete unconsciousness without any sign of fear, or of impending suffocation, and requiring, as a rule, smaller quantities of the general anesthetic to produce the desired effect.

Delbert and Dupont,³ on the other hand, review their experience with this method of narcosis and report 2 fatalities among 120 patients. They refer to Flateau's one fatality in 30 cases, Piffier's 3 in 64 cases, and Bloss' several serious mishaps and one death in 105 cases. They declare that the advantages ascribed to the use of scopolamine for this purpose are more apparent than real.

Hatcher,⁴ who has made an exhaustive study of the problem, considers the subject from the standpoint of the recorded cases rather

¹ Journal of the American Medical Association, March 26, 1910.

² Wiener klin. Wochenschrift, April 1, 1909.

³ Revue de Chirurgie, Paris, June, xxx, 967.

⁴ Journal of the American Medical Association, February 5, 12, 1910.

than from practical experience in its use. He has gone over a very large number of articles upon this subject and gives references to no less than seventy-two of these articles. Hatcher expresses what seems to be the present consensus of medical opinion on the use of these agents for the purposes named. He reaches the following conclusions:

1. The use of scopolamine and morphine alone, and unsupported by chloroform, ether, or other anesthetic, is wholly unsuited for general anesthesia.

2. The use of scopolamine and morphine preliminary to that of chloroform or ether has certain advantages, but it renders the problem of anesthesia more complicated, requiring extreme care, judgment, and discretion.

3. There are numerous contraindications to the use of scopolamine and morphine, both in surgery and childbirth.

4. It seems probable that scopolamine and morphine may have a sphere of usefulness in childbirth, as well as in surgery, but there are many details which require perfecting before they can become generally useful even in institutions.

5. Scopolamine and morphine are wholly unsuited, in the present state of our knowledge, for use in general obstetric practice.

6. The pharmacology of scopolamine and morphine, and of the interactions of the two, are of prime importance in the study of their uses in surgery and obstetrics.

7. There is no possible excuse for the employment of ready-made mixtures (pills or solutions) of scopolamine and morphine, since each substance must only be used with reference to its individual actions, bearing in mind that these actions may be greatly augmented or modified by the other alkaloid.

8. The danger to the child must be kept constantly in mind, even when the utmost care has been exercised in the selection of cases suitable for the use of scopolamine and morphine in childbirth, and when small doses are ineffective in inducing the "twilight sleep," large doses should not be used.

It is manifest that a much larger number of cases will have to be considered from the statistical standpoint before it will be possible to reach definite conclusions in regard to this important matter, but it is noteworthy that, although new methods of relieving pain are being continually brought forward, the older anesthetics, nevertheless, are most generally preferred by conservative physicians and surgeons. Even the most enthusiastic advocates have warned of the danger of the indiscriminate use of the combination of two such dangerous drugs, insisting that the method should be employed only in institutions where any untoward effect may be guarded against.

Sea Water. Quinton, a French physiologist, elucidated the theory of the marine origin of life; since then many investigators have been

experimenting with sea water. After proper dilution, the sea water was made isotonic with the blood plasma, and contained all the mineral salts necessary to the growth and development of the cells of the body. Boutillier¹ made observations in a series of thirty cases as to the *effects of this solution upon nutrition*. He seems to think that the treatment is of most value in cases in which nutrition is at fault, namely: Inanition, malnutrition, marasmus, and chronic indigestion.

The site of the injection is just below the angle of the scapula, or in the gluteal region. The amount injected in infants and children varies from 10 to 60 c.c., the usual dose being from 15 to 30 c.c., depending upon the age of the patient and the urgency of the case. Injections are given from three times a week to every day for a short period of time, the amount being increased until the desired effect is produced. Boutillier finds that there is a slight increase in amount of urine voided following the first few injections; in many instances, improvement also in the condition of the stools was noted without any change having been made in the food. This fact he regards as significant because some of these patients were breast-fed, while others had been under observation for varying periods of time before treatment was commenced. There is improvement in the appetite and in the amount of food taken within the first two or three weeks, this is noticeable in older children suffering from malnutrition or chronic indigestion. In infants, in whom colic has been one of the distressing symptoms, he found it to be relieved invariably within the first two weeks. The skin, in many cases, at the commencement of treatment was found to be harsh, dry, and more or less scaly. This condition cleared up rapidly, leaving a perfectly healthy skin by the close of treatment. The infants who were either losing weight or stationary would, as a rule, begin to gain after the first few treatments, in some instances gaining as much as one ounce daily while under treatment. Many patients who were restless and wakeful at night improved markedly and enjoyed a restful sleep.

Sparteine. Sparteine is a liquid volatile alkaloid; derived from scoparius, common name, Broom. It possesses decided basic qualities, but contains no oxygen. Dose, gr. $\frac{1}{67}$ to $\frac{1}{6}$.

When sparteine is administered in small doses, it causes a slowing and strengthening of the heart beat; by raising the arterial tension, and increasing the cutaneous and renal circulation, the skin becomes flushed and moist, and a marked diuresis and diaphoresis is produced in some cases.

The action of sparteine is directly upon the cardiac muscle, as well as upon the cardio-inhibitory mechanism, thereby giving greater force to the contractions of the heart, and slowing the pulse rate. It has a stimulating action on the vasomotor centre, causing a great contraction

¹ Journal of the American Medical Association, January 1, 1910.

of the vessels in the splanchnic area, thereby increasing the cutaneous and renal circulation and raising arterial tension greatly.

While the general action of sparteine is to diminish the rate of the heart, yet it will quickly accelerate an abnormally slow pulse.

Redefield¹ gives the following *indications for the use of sparteine*:

1. Sparteine is the indicated remedy in *functional derangements and organic diseases of the heart*, when the action of the heart is irregular, as well as in the feeble hearts met with so often in those patients who are hysterical and nervous.

2. In *mitral regurgitation* the administration of sparteine is quickly followed by relief of all the symptoms.

3. It should be remembered in cases of *mitral stenosis* characterized by a weak, small, and irregular pulse.

4. It is of great service in *aortic regurgitation* when it quiets the excited action of the heart without prolonging the systole unduly.

5. It has been found extremely serviceable in *asthma*, in which it cuts short the paroxysms and renders their occurrence less frequent.

6. It should be studied in *valvular lesions of the heart* accompanied by a broken or threatened failure of cardiac compensation, as it has a good effect in establishing a compensation. Adonidin can also be given either jointly or in alternation with sparteine in these cases to good effect, as the cardinal indications for adonidin are failing or broken cardiac compensation.

7. Cases of *dyspepsia* characterized by a great accumulation of gas in the intestines, extreme mental depression, and an accompanying disturbance of the heart rhythm, call for the use of sparteine, as its action in these cases is most favorable.

8. The sphere of greatest influence of sparteine is found in *functional derangements and organic diseases of the heart*, where a stimulating action is required, coupled with a minimum of increase in the tonicity of the arterial vessels, a relief of an existing dyspnea, palpitation, precordial pain, and edema. Sparteine in these cases will be productive of the best results, and as its action is one of long duration, it need not be given oftener than every two to five hours in order to maintain the desired effect. Waugh advises it especially as a cardiac tonic for aged persons.

9. In *chronic Bright's disease*, when the arterial tension is high and the heart hypertrophied, sparteine acts as a stimulant to the heart without increasing the arterial tension.

Strickler and Fleisher² showed that the intravenous injection of sparteine sulphate, followed by the intravenous injection of epinephrin, does not produce myocarditic lesions in dogs, a fact which seems to be of great interest, inasmuch as the lesions produced by similar injec-

¹ St. Louis Medical Review, August, 1910.

² Journal of Pharmacological and Experimental Therapeutics, August, 1910.

tions in rabbits are so very pronounced. It is probable that this difference is due to the fact that the heart of the dog is relatively stronger than that of the rabbit and is consequently better able to resist the injurious effect of these substances.

Strophanthus. Since the introduction of this agent by Fraser, strophanthus has held a reputation as a heart stimulant second only to digitalis. The variable clinical results obtained, however, have been the cause of much discussion.

Until recently it had been used by the mouth almost exclusively in therapeutics, but when employed by intravenous injection the results have been more nearly in accord with its pharmacological action.

The *intravenous method* as a therapeutic measure was first introduced by Fränkel in 1906, and since then it has been used fairly freely, and a number of papers have been published giving experiences with the drug. Boyd,¹ in writing on this topic, states that it is essential for the safe and satisfactory use of such a powerful drug by intravenous injection that we should have chemical purity and exactitude of dosage.

Heffter has examined a number of samples of strophanthins which are at present on the market. He finds great difficulty in accepting the present chemistry of strophanthus. Strophanthin should be the glucoside obtained from the dry ripe seeds of *strophanthus kombe*, freed from the awn, for the commercial seed usually contains the seeds of other species in addition to those of *strophanthus kombe*. Commercial strophanthus in the amorphous form shows considerable differences both in chemical and pharmacological properties, which would seem to indicate that its intravenous use must be conducted with the greatest care. Heffter found, from pharmacological observations on animals, that Merck's strophanthin was one and a half times stronger than that of Boehringer, or of Schuchart. Obviously, therefore, an intravenous dose of one might be safe, while the same dose of the other might produce dangerous toxic symptoms. He considers it fortunate that thus far there have been so few fatal results—eight have been collected by Liebermeister.

Liebermeister considers strophanthin as a cardiac remedy of extraordinarily effective action, though there are cases in which it seems to fail. When the heart does not respond, he deems it inadvisable to increase the dosage. When the heart responds to intravenous injections of strophanthin, in a dosage of 0.5 to 1 mg., the action appears in from one minute to half an hour, showing itself by the increased amplitude and diminished frequency of the pulse. In many instances, one injection without any other cardiac remedy, is all that is required for the reestablishment of a broken compensation in cardiac disease. The action of the injection usually continues for several days. A second injection produces a prompter and more enduring effect.

¹ Edinburgh Medical Journal, December, 1909.

Stone¹ believes that in strophanthin we have a powerful agent for good, if used with discretion, and one with which disastrous consequences may occur if it is used recklessly. In certain cases, the intravenous use of strophanthin has a most favorable effect in restoring cardiac compensation. The immediate result is to increase the amplitude of the pulse wave. The frequency of the heart is at the same time slowed within a few minutes, almost, if not quite, as completely as can be accomplished by the administration of digitalis preparations by the mouth in the course of several days. This immediate relief will last for from twelve to seventy-two hours and in some cases even longer, and is usually accompanied by free diuresis, or will permit diuretics previously inert to become once more active. Stone points out the dangers from the intravenous use of strophanthin, and says they must not be underestimated. The therapeutic dose and the poisonous dose are near together, and, as the elimination of the drug is slow, one can easily get toxic symptoms of slowed pulse and of heart block from too frequent administration. The previous administration of digitalis is an almost sure contraindication to the use of strophanthin, and it is in these cases especially that the majority of deaths which have been attributed to strophanthin have occurred. Cases in which renal symptoms are prominent do not respond as favorably to the use of strophanthin. A high blood pressure is not a contraindication, but a marked bradycardia always is. Stone gives the strophanthin in doses of 1 mg. which dose should not be repeated within twenty-four hours unless in exceptional cases.

Crispolti² has made numerous experiments with Merck's, and also with Boehringer's strophanthin. He gives by the mouth 1 to 4 mg., and up to 4 mg. a day; by intramuscular injection, 1 mg. and up to 3 mg. a day; by intravenous injection, 0.25 to 1 mg. and up to 2 mg. a day. Strophanthin is very uncertain in its action when given by the mouth, according to Crispolti; small doses are without any effect, while larger doses rapidly produce symptoms of intolerance. Signs of an overdose are headache, a sense of tightness in the chest, marked slowing or bigeminy of the pulse, marked rise in the blood pressure, cardiac arrhythmia, insomnia, nausea, and vomiting. Such signs are least marked and most transient when the drug is given intravenously. Crispolti gives, as contraindications to the use of strophanthin, high blood pressure, marked arteriosclerosis, and acute and chronic nephritis.

Stone,³ in discussing the uses of strophanthin in other than cardiac disease, tells us that, although the majority of cases reported upon by the various writers have been cardiac, and although it is without doubt that the greatest usefulness of strophanthin administered intravenously

¹ Boston Medical and Surgical Journal, 1909, vol. xvii, p. 586.

² Il Policlinico, Rome, 1909, vol. xvi, p. 248.

³ Boston Medical and Surgical Journal, August 19, 1909.

is in cases of *broken compensation*, nevertheless, it has been tried in a variety of other conditions with a varying amount of success. The failures have, from the nature of things, far exceeded the successes, as for the most part it was tried in practically hopeless cases. Liebermeister, in a series of *pneumonia* cases, although he had no striking results, stated his belief that its use would enable a certain number of severe cases to be carried along until the patient was able to eliminate the toxin of the pneumococcus.

From a study of the literature, one may conclude that the intravenous administration of strophanthin is a procedure which should be reserved for grave emergencies, and, while the technique is simple, there are disadvantages and dangers attending its administration which have led many to adopt the intramuscular method of administration when immediate action was not essential.

Thiosinamine. For the past eighteen months experiments has been carried out with thiosinamine in the treatment of *chronic adhesive otitis media*, by Fernandez.¹ Although the experience was short and the cases not very numerous, the results were so uniform that the author feels justified in making some remarks about this drug, which has, with or without reason, awakened widespread enthusiasm in several branches of medicine, but especially in otology.

Hebra, in 1892, claimed that it exercised a beneficial action upon the lupus tissue and obviated the formation of disfiguring cicatrices. Tousey, in 1897, first used thiosinamine in otology, and Tapia, in 1903, made extensive experiments with the drug. This drug does not give good results in any otitis outside of the adhesive variety, but it has been successful in some cases of the adhesive otitis. Fernandez cites several cases in which he used the drug, but it is evident that the results in these experiments were not very encouraging. He used thiosinamine associated with antipyrin (according to Mitchel's prescription) in six cases of adhesive otitis, and the results have been far from satisfactory. He proposes to use a combination of thiosinamine and sodium salicylate, which he thinks would be less apt to provoke the accidents which were encountered when thiosinamine was used alone or in combination with other drugs. Before rejecting the drug altogether, Fernandez proposes to experiment with sodium salicylate and thiosinamine combination in another series of cases.

Charteris² used the drug in a case of *fibrous ankylosis of various joints* following an attack of rheumatoid arthritis. The drug was tried for seventeen weeks in doses of one grain thrice daily by the mouth. Despite the fact that the adhesions were broken down under chloroform, and that massage, passive movements, and weight extension were used, almost no effect was produced; as soon as these mechanical measures

¹ Medical Record, June 26, 1909.

² British Medical Journal, August 28, 1909.

were stopped, the ankylosis became as bad as ever, despite the use of thiosinamine. In another case of older standing, in which rheumatoid arthritis had resulted in very firm fibrous adhesions of the wrist and fingers, the daily use of *fibrolysin* (a soluble double salt of *thiosinamine*) injections for three weeks produced no benefit, though combined with massage and electrolysis of sodium iodide. In another case of fibrous ankylosis of the shoulder-joint, the adhesions were twice broken down under chloroform, but even with this, fibrolysis injections failed to prevent the recurrence of fixation.

Investigations into the pharmacological action of the drug do not bear out the alleged selective action on fibrous tissue. Tyrode, the most recent investigator, found that in animals to which large doses had been given, there were rapid loss of weight and increased proteid metabolism, with fatty degeneration of the heart and kidneys, but he particularly noted that no histological alteration could be detected in the fibrous tissue of these organs. Leonardo states that he could find no histological changes in scar tissue, but that he obtained a marked leukocytosis in dogs. Leonardo, Wolf and others believe that thiosinamine is an energetic lymphagogue which attracts leukocytes and produces local hyperemia.

Charteris¹ has made many observations to determine the *effect of thiosinamine upon the blood* of individuals receiving the drug. First of all he attempted to discover if it had any chemotactic influence. Thus sterile glass capillary tubes were partially filled with the drug, in solid form and in solution, and introduced into the peritoneal cavity of pithed frogs. At the end of twenty-four hours the tubes were withdrawn and examined under the microscope to determine whether there was any accumulation of leukocytes in the tubes. In no instance could the presence of leukocytes be demonstrated inside the tube. This finding is quite in accord with that of Winternitz, who found that thiosinamine caused no focal necrosis or local accumulation of leukocytes at the site of injection.

In an attempt to determine whether or not the drug has the power of causing any marked leukocytosis, the author has made numerous counts upon patients and upon healthy men. As a rule, after the injection of considerable doses, no leukocytosis could be demonstrated. Sometimes there was a trifling increase in the number of white cells, and in a single instance an increase of 100 per cent. was recorded. The counts were made at first at intervals of forty minutes, and counting in some cases was continued for forty-eight hours.

Thyroid Extract. The experimental studies of the action of the thyroid gland and its products have been based largely upon surgical removal of the thyroid and also of the parathyroids, and thereby complicating

¹ British Medical Journal, August 28, 1909.

the symptoms and making deductions unreliable. Pick and Pineles¹ have therefore reinvestigated the subject.

They used young goats for their experiments, for it has been shown that in this animal the thyroid gland can be removed with comparative ease and without injuring the parathyroids. Furthermore, the clinical picture of myxedema is well marked in the goat, especially when the gland is removed early in life.

The fresh thyroid glands used in the treatment of thyroidectomized goats were obtained from hogs. Pick and Pineles have studied the therapeutic effect of the following substances: Thyroid gland; iodothyryn; thyreoglobulin; thyreoproteid; and products of peptic and tryptic digestion of the thyroid gland, including primary and secondary albumoses and further cleavage products obtained separately. They find that thyroid gland and thyreoglobulin have a marked and rapidly beneficial action. Secondary albumoses derived from hydrolysis of the thyroid are also active, but apparently less so than the former substances. Thyreoproteid, iodothyryn, and the less complex products of digestion of the thyroid were wholly inert. The authors conclude that their experiments offer no ground for the supposition that iodothyryne is the active constituent of the gland, or even that it is one of the active constituents. They are inclined to believe that iodothyryne is capable of stimulating the thyroid gland to increased activity and attribute the favorable results in myxedema to the stimulation of the gland itself, a part of which they assume has persisted, but is functionally insufficient.

Carlson and Woelfel² investigated the *nature of the thyroid lymph*, which they found did not differ materially from the lymph of the neck or thoracic lymph. It did not contain iodine in appreciable quantities, and the intravenous injection of thyroid lymph had no specific effects on the circulation. The authors favor the detoxication hypothesis of Cyon as explaining the fixation of iodine in the thyroid, that organ acting as a special filter to retain iodine which would otherwise be toxic to the organism. The iodine may be deposited in connection with, or without colloid. The iodine absorbing power appears to be a function of the thyroid in a special degree and is not exhibited by the colloid of other organs.

Simpson³ has employed thyroid treatment in *infantile wasting*, with good results. He gave thyroid in a diluted milk and cream mixture with sodium citrate, one or two grains to the ounce of milk. In a day or two cream was gradually added, half a teaspoonful to the feeding bottle. Out of 80 cases thus treated, 72 were infants under nine months, and their history was simply one of wasting. The other 8 had a wasting

¹ Ztschr. f. exp. Path. u. Therap., 1909, vol. vii, p. 518.

² American Journal of Physiology, Boston, April, 1910.

³ British Medical Journal, April 30, 1910.

supervening on some acute disease; 63 cases did well; 5 cases presented syphilitic histories in which wasting was a marked symptom; mercury was first given and later thyroid. Three of these 5 immediately gained in weight and eventually recovered. In older children the results have also been favorable, except when tuberculosis was present. In children under nine months of age, the author began with one-third grain of dried thyroid once daily and in older children he gave up to one grain once daily, according to the age of the child. In giving the thyroid it is advisable, he says, to test the feces to see whether they are acid or alkaline. In 2 cases, in which thyroid appeared to produce no good results, he found the stools very markedly acid. Sodium bicarbonate was then given three times a day, and shortly afterward both children began to improve. Cases treated at home did better than those treated in hospitals. It seems, says the author, that the amount of nursing and general "mothering" that is possible at home, but not in hospitals, is very beneficial in such cases and conduces to a more rapid recovery.

A histological study of the *thyroid gland in mental diseases* was made by Peabody,¹ who examined fifty cases. Excluding a case of exophthalmic goitre and one of acromegaly, about 77 per cent. of the series showed changes. A possible relation between the thyroid gland and the process of emaciation is seen in the fact that 64 per cent. of the subjects with "normal" thyroids (11) had become emaciated under hospital conditions, whereas none of the individuals with chronic thyroiditis (12) showed emaciation. Again, only 13 per cent. of the subjects showing follicular or interstitial excess of colloid had become emaciated, so that the question arises whether such histological "excess" means excess or defect in thyroid constituents in the body at large.

Siegmund,² in discussing *organotherapy in surgical prophylaxis*, declares that the technique of the surgeons cannot be perfected much further, and yet the outcome of operations is still a matter of chance in a great degree. This is owing to the individual conditions of tolerance and resistance in the different cases, just as one person contracts typhoid while others, equally exposed, escape. He relates his experience with two cases which suggested that this individual tolerance and resistance may have been due to the individual functioning of the ductless glands, the thyroid in particular. In one of the cases, a woman, aged thirty-four years, had displayed, from childhood, a tendency to suppuration after the slightest traumatism; after a slight injury to the arm from broken glass she developed an extensive suppuration of the entire limb. In the other case, the reverse was observed; a seton in the back of the neck was made with intentions of causing a local suppuration to relieve vertigo and roaring in the ears caused by sclerosis of the middle ear,

¹ Boston Medical and Surgical Journal, August 4, 1910.

² Deutsche Zeitschrift für Chirurg., Leipsic, June, 1910.

a procedure which had cured another patient. Although the seton was tended carefully every day, yet suppuration failed to appear. In both of these cases, the outcome was just the reverse of what the surgeon willed it to be. The third case suggested the course to be followed and the possible results that might be obtained through organotherapy in *suppurating wounds*. This case was a small child with a wound on the head which suppurated, without any tendency toward healing. Siegmund noticed that the older children in the family showed signs of thyroid insufficiency. He administered thyroid extract, on the supposition that the suppuration was maintained by deficient thyroid functioning, with the remarkable result that the wound healed rapidly under the thyroid treatment. Siegmund believes that his other two cases presented signs of thyroid insufficiency and that thyroid treatment was also indicated in them. Prophylactic thyroid treatment in *puerperal sepsis*, he explains, has many arguments in its favor, and calls attention to the fact that the thyroid may have brief periods of disturbed functioning, when at other times it does its work normally.

Tuberculin. In PROGRESSIVE MEDICINE for 1908, I reviewed tuberculin therapy and its diagnostic value. Tables of dosage, methods of administration, indications and contraindications, were gone over. Since then a mass of literature has accumulated, relating experiences of many competent observers with tuberculin therapy.

Baldwin,¹ in writing on the subject, states that the therapeutic use of tuberculin has two fairly definite objects in view: One is to diminish the sensitiveness to the toxin—*i. e.*, to itself—the other is to create intermittent local reactions and thus to stimulate the diseased focus to heal or become absorbed. The possibility of the production of a recognizable immunity to the disease thus far by any form of tuberculin treatment is open to question. A certain degree of resistance is indirectly accomplished when sensitiveness to tuberculin is decreased to a marked degree, accompanied by constitutional improvement. Such specific resistance as can be obtained by tuberculin is gradually lost after the treatment is discontinued, so that statements that patient's can be made "immune" are unjustifiable. The degree of tolerance, or immunity, to tuberculin is proportionate to the dose that can be borne without reaction. Hence the progressive increase of dosage is essential to obtain that object. When only reactions about the focus of disease are desired, the dosage need not be increased so long as sensitiveness persists to small doses. As soon as this is overcome the treatment should be interrupted until sensitiveness returns, or the doses must be increased to an unwise degree.

It must be seen, from the above statements, that only those patients that are in a fairly quiescent state of the disease are likely to be benefited

¹ Journal of the American Medical Association, vol. liv, p. 260.

by tuberculin treatment. Patients with pulmonary tuberculosis should be in a fairly good state of nutrition and free from persistent fever over 100° F., hemoptyses, night sweats, chronic diarrhea, or extensive laryngeal complications. The disease in the lungs should be localized. Tuberculin immunization is the only safe object to be held in view for the majority of pulmonary cases. Reactions are to be studiously avoided, and may involve danger when repeated, except in cases of well-arrested, localized disease. Slight unperceived focal reactions probably occur under any form of tuberculin treatment and, when rightly timed, are beneficial. The focal reactions can best be observed and applied with safety in cases in which the focus is localized in the skin, bones, joints, or genito-urinary tract, and in which the lungs are not involved.

Escherich¹ gives an extensive description of the *mode of action of tuberculin in treatment of tuberculosis* in children and adults, and his experience with it in a large number of cases of children under fourteen years of age. The conditions are different, he remarks, in children and adults; in the former, the more intense skin reaction shows a capacity for more active production of anaphylaxis. In adults, the main feature of tuberculin treatment is the production of antibodies similar to the curative process in diphtheria. In children, the aim is to increase the anaphylactic body and the accompanying focal reaction, imitating in this way the process of spontaneous healing in children. He calls the first "immunizing," and the other, the "anaphylizing" method. The latter is especially indicated for ailing, pale children, with languid appetite, slight tendency to fever at times, and night sweats, possibly enlarged glands in the neck and a slight tendency to changes in the dulness over the lung and breathing sounds, explained by the Röntgen rays as the result of enlarged bronchial glands, or a thickening in the hilus. These children have a latent tuberculous infection located in the bronchial glands, and the toxic action from it is evident throughout. Iron and arsenic seem to do no good, but injections of minute doses of tuberculin at considerable intervals seem to arouse the tissues from their torpid condition and stimulate a rapid repair. The children feel better in a short while, the appetite returns, and the tendency to fever and night sweats markedly decrease, while the physical changes subside and entirely cease to be manifest in two or three months. The substance provided by the injection of small doses of tuberculin stimulate the production of anaphylaxis, and the natural healing process is given a powerful impetus. This method of treatment has not only a curative but a prophylactic action against recurrences later. It should be supplanted with the usual general measures for tuberculosis, and the best results are obtained in children that are in a relatively good

¹ Wiener. klin. Wochenschrift, Vienna, xxiii, p. 723.

condition, since the success of the treatment depends upon the reacting power of the organism.

Lowenstein¹ reviews the results obtained at the Bellitz sanatorium with tuberculin treatment in 300 cases of open pulmonary tuberculosis. In an experience with 1000 cases, he has never observed a dangerous hemorrhage which could be ascribed to the influence of a preceding injection of tuberculin. He comments on the discovery of the same tuberculin—neutralizing substances in the serum of patients who have spontaneously recovered from the disease and in those that were treated with “old” tuberculin. He found them well marked in 5 out of 35 patients examined, and the disease progressed rapidly to spontaneous recovery in their group of 5 patients. The specificity of the reaction and the radical basis for tuberculin therapy, he believes, are confirmed by these findings.

Lowenstein believes that the contraindications to tuberculin treatment are persisting headache; localization of the infection in the central nervous system; nephritis, unless of tuberculous origin; diabetes; epilepsy; and pregnancy. He no longer regards mitral insufficiency as a contraindication to the treatment. He is convinced that smaller doses are more liable to induce anaphylaxis. The main object is to avoid the introduction of new toxins before the effect of previous injections have entirely subsided. In case of a strong general reaction with focal phenomena, such as increased expectoration, and local reaction in the larynx, the organism must be given time to recover from the reaction. Thus, after a reaction of 102.2° F., he patiently waits for fourteen to eighteen days, and after a milder reaction for seven to ten days. During later phases of immunization, the intervals should be at least ten days. He terminates the course when the patient can stand 0.5 gram of tuberculin without a reaction. He makes it a principle not to reduce the dose after a reaction, but increases it, more or less, according to the intensity of the reaction until the patient has reached the maximum dose.

Hamman and Wolman² write concerning the *tuberculin treatment of dispensary patients*. They have used tuberculin in the dispensary without danger and with the most satisfactory results. A degree of intelligence is essential, the patient must be willing to undergo a long and often a tedious cure, and must be faithful in carrying out instructions. The early cases, they believe, are much more favorable for the treatment, but they included, in their series, the disease in all stages. Note-books were used by the patients in order to more effectually obtain the patients' coöperation. Hamman and Wolman deem it essential to have a visiting nurse to instruct and supervise the patients in their homes.

The usual hygienic and dietetic measures were ordered, in addition

¹ *Therapeutische Monatshefte*, Berlin, vol. xxiii, p. 567.

² *Bulletin of the Johns Hopkins Hospital*, 1909, vol. xxi, p. 225.

to the tuberculin. Fever of a mild grade, when other symptoms are favorable, they do not consider as a contraindication to the treatment, but the patients were kept in bed whenever fever occurred spontaneously, or as a result of tuberculin injections. The duration of the treatment is based rather on the progress of the case than on the condition at the beginning of the treatment. The early cases, and those that do well, they found, took the largest doses, while the advanced and progressive cases reached their limit of tolerance early. The total number of patients who received the tuberculin treatment was 112, but they report only those that were under treatment at least ninety days—a group of 71 cases—14 of these 71 cases were not positively pulmonary tuberculosis, although probably so. All these patients improved as regards their tuberculous symptoms and the suggestive physical signs disappeared. Of the remaining 57 cases that had positive signs of tuberculosis, 13 were incipient, 16 moderately advanced, 28 far advanced. Of the 57 patients, 10 were apparently cured, in 16 the disease was arrested, 12 were improved, 18 were progressive, and 1 far advanced case died. Of the 18 progressive cases, 4 improved as regards symptoms, 10 were unchanged as regards symptoms, and 4 far advanced cases were worse as regards symptoms. Of the 13 incipient cases, only 1 was progressive; of the 16 moderately advanced, 2 were progressive; of the 28 far advanced, 16 were progressive. The average gain in weight for the entire group was six and one-half pounds. The maximum gain in weight was forty-one pounds, and occurred in a far advanced case.

Wildbolz¹ states that the microscopic examination of the kidneys in 5 cases, after prolonged courses of tuberculin treatment, failed to reveal any tendency to healing of the tuberculous processes in the kidney under the influence of the tuberculin. In 4 of the patients, the tuberculosis was restricted to one kidney and the conditions were unusually favorable for a cure if the tuberculin treatment had been able to effect such, but in every instance the disease progressed and nephrectomy became necessary in time. There were no evidences of an injurious action from the tuberculin in any of the kidneys. His conclusions are that tuberculin has a general favorable, toxin-binding influence in case of kidney tuberculosis, but no appreciable local action on the lesions. In his 31 cases, the general health almost invariably improved under the tuberculin, but no patient was cured or even relieved from his local disturbances. In early cases of unilateral kidney tuberculosis, a trial of tuberculin is justified, especially in the young. By this means it may be possible to benefit in some cases, and the constant oversight required with tuberculin treatment enables a prompt decision as to when nephrectomy should be advised or enforced, while findings in the kidney will throw light on the actual action of tuberculin in such cases.

¹ Berliner klin. Wochenschrift, June 27, 1910, p. 1213.

Hawes and Floyd¹ give the following summary and conclusions as a result of their study of tuberculin treatment in dispensary patients.

1. Out of 143 patients with various forms of tuberculosis treated with tuberculin during the past four years, 19 have died, 16 have shown no improvement, while 108 have been benefited to a greater or less degree.

2. In no instance have they been able to see that tuberculin has done the slightest harm, reactions have been rare and invariably of a very mild type.

3. In incipient pulmonary tuberculosis, especially in children, tuberculin is a factor in increasing body resistance so as to prevent relapses. In more advanced pulmonary disease, tuberculin will often alleviate distressing symptoms, prolong life, and occasionally help to arrest the process.

4. In localized or "surgical" tuberculosis, tuberculin has a markedly beneficial effect. Its administration should always be combined with hygienic outdoor treatment, and, in the vast majority of instances, should be subservient to this.

5. Dispensary patients can be treated with tuberculin not only with perfect safety, but with benefit, providing there is a close personal coöperation between patients and physician.

Voorsange,² in his article on "The Present Status of Tuberculin Therapy," says that Trudeau, who has used tuberculin over a longer period of time in more cases and more conservatively than any other man in the United States, shows that 18 per cent. more of treated incipient cases are living than of untreated, while 25 per cent. more of advanced cases which received tuberculin are living than of those which did not take the treatment.

Veronal. Möller reports a series of 100 cases of *delirium tremens* treated with veronal. There were 2 deaths, 1 from double pneumonia, and the other in a patient who had had many previous attacks, and was extremely weak upon admission to the hospital. Aside from these 2 cases, Möller obtained remarkably good results. Upon admission into the hospital, 1 gram of veronal was given, and if no sleep followed within three hours, a second dose of 1 gram was given. This second dose was seldom required. Sleep usually came on rapidly and lasted from six to twelve hours. Upon waking, the patient is mentally clear and quiet. A half-gram of veronal was sufficient to control subsequent tremors. If insomnia persisted, a half-gram of veronal was administered at night to insure sleep. In one case, veronal dermatitis was observed; otherwise no untoward results were noted. Möller says that this method of treating *delirium tremens* has the great advantage that it is eminently suitable for home treatment.

¹ Boston Medical and Surgical Journal, January 6, 1910.

² American Journal of the Medical Sciences, January, 1910.

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